EE318061887US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. **AT9-98-737**

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:
Transmitted herewith for filing is the patent application of Inventor(s):

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For: METHOD AND SYSTEM FOR ENABLING A NETWORK FUNCTION IN A CONTEXT OF ONE OR ALL SERVER NAMES IN A MULTIPLE SERVER NAME ENVIRONMENT

Enclosed are also:

X	48	Pages of Specification
X	5	Pages of Claims
X	19	Sheet(s) of Drawings
X	1	An Abstract
X		A Declaration and Power of Attorney
X		Form PTO 1595 and assignment of the invention to IBM Corporation

CLAIMS AS FILED

FOR	Number Filed		Number Extra		Rate		Basic Fee ($760)
Total Claims	22	-20 =	2	X	$ 18	=	$36
Independent Claims	3	-3 =	0	X	$ 78	=	$0
Multiple Dependent Claims	0			X	$260	=	$ 0
					Total Filing Fee	=	$796

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METHOD AND SYSTEM FOR ENABLING A NETWORK FUNCTION IN A CONTEXT OF ONE OR ALL SERVER NAMES IN A MULTIPLE SERVER NAME ENVIRONMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is related to Application Serial Number (Attorney Docket Number AT9-98-709), filed (concurrently herewith), titled "Method and System for Multiple Network Names of a Single Server," hereby incorporated by reference, and Application Serial Number (Attorney Docket Number AT9-98-713), filed (concurrently herewith), titled "Method and System for Dynamic Addition and Removal of Multiple Network Names on a Single Server," hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates generally to an improved data processing system and, in particular, to a method and system for using server names in a distributed data processing environment.

2. Description of Related Art:

As electronic commerce becomes more prevalent, business relationships between vendors and between a vendor and its customers becomes more valuable. Businesses are more willing to protect those

relationships by spending more money on information technology that protects the integrity of their electronic commerce connections. In so doing, businesses protect not only their data and cash flow but also intangibles such as reputations and goodwill. In addition, the complexity of information technology, the pressure of global competition, and the demands of universal access and round-the-clock availability of electronic systems greatly increases the need to minimize disruptions in electronic commerce operations.

A corporation's information technology infrastructure may fail at various pressure points, such as telecommunication links, software application errors, and computer hardware failures. The complexity of distributed data processing systems places greater reliability demands on all of these factors. One method of increasing the reliability of a system is building redundancy into a system.

When a server fails in a network that contains more than one server, another server can assume the responsibilities of the failed server. In order for a recovery server to assume the role of a failed server, the recovery server needs to be able to respond to requests to the failed server on the network.

Typically, a cluster of servers are configured to respond to a shared cluster name, and each of the servers in the cluster assumes a portion of the duties related to the total demand placed on the cluster by clients. If a server fails, the set of servers in the cluster was already configured to share the processing duties among

the other servers in the set, and the failure of a single server merely places a slightly larger processing load on the remaining servers in the cluster.

However, configuring a cluster for fail-over can be rather cumbersome. In one method, in order to set up a cluster of servers that can fail over to each other, all of the existing server names must be assembled and placed into a fail-over group of names. The individual servers are then given other new names.

In addition to fail-over, there are other scenarios for networked servers in which a server is either brought on-line or taken off-line in an effort to improve the reliability of the system. The addition of new hardware, the maintenance of previously installed hardware, and the migration of servers are merely a few examples.

It would be advantageous to have a method of configuring servers so that a server may easily assume the responsibilities of another server in a fail-over situation. It would be particularly advantageous if the same method may be used in such a way that resources on a host computer may be easily administered on a server-by-server basis.

SUMMARY OF THE INVENTION

The present invention provides a method for executing a function on a server in a distributed data processing system. The server responds to requests directed to a set of server names. A function request has an input that specifies a server name in the set of server names. The function is executed on the server in a server name context specified by the input containing the server name. The server name context on the server has a set of resources associated with a server name. A unique server name tag is generated for each server name in the set of server names, and each resource in the set of resources is identifiable by the server name tag associatively stored with the resource.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a pictorial representation of a distributed data processing system in which the present invention may be implemented;

Figure 2 is a block diagram depicting a data processing system, which may be implemented as a server;

Figure 3 is a block diagram illustrating a data processing system in which the present invention may be implemented;

Figure 4 is a block diagram depicting a simplified network architecture that shows software components that may communicate with each other across the depicted network;

Figure 5 is a block diagram depicting software components within a server that provides for multiple network names on the server;

Figure 6 is a flowchart showing a method in which a single computer may be configured with multiple network names;

Figure 7 is a block diagram depicting a single server configured with multiple network names;

Figure 8 is a flowchart depicting a process of using multiple network names on a single server to provide data processing services to a client;

Figures 9A-9D are simplified network diagrams providing an example of using multiple network names for a single server;

Figures 10A-10C are simplified network diagrams depicting a migration scenario in which a server that is initially configured to respond to multiple server names is reconfigured so that multiple servers may respond to those server names;

Figure 11 is a block diagram depicting the system components for a host computer whose capabilities have been extended to include the dynamic addition and removal of multiple network names on a single server;

Figure 12 is a flowchart depicting the manner in which APIs may be used for dynamic addition and removal of multiple network names on a single server;

Figures 13A-13D are simplified network diagrams depicting a method of providing bi-directional fail-over capability using the dynamic addition and removal of multiple network names for a single server according to the present invention;

Figures 14A-14C are simplified network diagrams depicting an environment in which a migration scenario may be implemented using the method for dynamic addition and removal of multiple network names on a single server according to the present invention;

Figure 15 is a flowchart depicting a method for enabling a network application programming interface to function in the context of one or all server names in a multiple server name environment;

Figure 16 is a diagram depicting a data structure for separating share resources by server name within a context of one or all server names in a multiple server name environment;

Figure 17 is a diagram depicting a data structure for separating session resources by server name within a context of one or all server names in a multiple server name environment;

Figure 18 is a flowchart depicting a method for generating the name masks for use in the server modules for identifying a server name context for the execution of APIs in those modules when more than one server name is in use on the physical server machine; and

Figure 19 is a flowchart depicting a name mask used to retrieve or filter information associated with particular server name contexts when more than one server name is in use upon a physical server machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, **Figure 1** depicts a pictorial representation of a distributed data processing system in which the present invention may be implemented. Distributed data processing system **100** is a network of computers in which the present invention may be implemented. Distributed data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within distributed data processing system **100**. Network **102** may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone connections.

In the depicted example, a server **104** is connected to network **102** along with storage unit **106**. In addition, clients **108**, **110**, and **112** also are connected to a network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. For purposes of this application, a network computer is any computer, coupled to a network, which receives a program or other application from another computer coupled to the network. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. Distributed data processing system **100** may include additional servers, clients, and other devices not

shown. In the depicted example, distributed data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, distributed data processing system **100** also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

Referring to **Figure 2**, a block diagram depicts a data processing system, which may be implemented as a server, such as server **104** in **Figure 1**, in accordance with a preferred embodiment of the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**. Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**. Memory controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI

local bus **216**. A number of modems may be connected to PCI bus **216**. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI buses **226** and **228**, from which additional modems or network adapters may be supported. A memory-mapped graphics adapter **230** and hard disk **232** may also be connected to I/O bus **212** as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RISC/System 6000 system, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram illustrates a data processing system in which the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect

(PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Micro Channel and ISA may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. SCSI host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system such as OS/2, which is available from International Business Machines Corporation. "OS/2" is a trademark of International Business Machines Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provides calls

to the operating system from Java programs or applications executing on data processing system **300**. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

For example, data processing system **300**, if optionally configured as a network computer, may not include SCSI host bus adapter **312**, hard disk drive **326**, tape drive **328**, and CD-ROM **330**, as noted by dotted line **332** in **Figure 3** denoting optional inclusion. In that case, the computer, to be properly called a client computer, must include some type of network communication interface, such as LAN adapter **310**, modem **322**, or the like. As another example, data processing system **300** may be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system **300** comprises some type of network communication interface. As a further example, data processing system **300** may be a Personal

Digital Assistant (PDA) device which is configured with ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations.

With reference now to **Figure 4**, a block diagram depicts a simplified network architecture that shows software components that may communicate with each other across the depicted network. LAN/WAN **400** connects host computer **402** named "Host A" and host computer **406** named "Host B". Router **404**, also connected to the network, routes data packets across the LAN between the depicted computers and other networks that may be connected to the LAN that are not shown in **Figure 4**. Host computer **402** may be similar to server **104** in **Figure 1**, and host computer **406** may be similar to clients **108-112** in **Figure 1**.

Three separate communication layers are shown in **Figure 4**: application layer **424**, session layer **426**, and network layer **428**. The software components within these layers may use a variety of protocols to communicate with each other. Network layer **428** contains IP **418** on host computer **402**, IP **420** on router **404**, and IP **422** on host computer **406**. These components provide low-level network communication using IP or Internet Protocol. Alternatively, other network protocols may be used on LAN/WAN **400** without affecting the execution of the higher-level layers of software.

Session layer **426** contains network services administration module (NSAM) **412** on host computer **402**, NSAM **414** optionally implementable on router **404**, and NSAM **416** on host computer **406**. The NSAM provides standard network communication services to applications, utilities, and drivers on various computer systems. NSAMs **412-416** may be similar to each other.

Application layer **424** contains server **408** and client **410** on host computers **402** and **406**, respectively. Each of these applications provides some type of end-user processing or other high-level computer services. Within the example of **Figure 4**, server **408** and client **410** are shown as applications residing on different host computers. Each host computer may support multiple clients and servers, and server **408** and client **410** could reside on the same host computer. However, server **408** may be providing some type of data in return to requests from client **410**, and in this type of computing environment, host computer **402** may be generally termed a "server" and host computer **406** may be generally termed a "client."

NSAMs **412-416** provide a generic depiction of software components within session layer **426**. The NSAM may be provided by a variety of standard network applications, such as NetBIOS and Transmission Control Protocol (TCP). Other protocols may be layered on top of these, such as various types of RPCs (Remote Procedure Call).

NetBIOS (Network Basic Input/Output System) is an operating system interface that allows applications on

different computers to communicate within a local area network. NetBIOS may also be viewed as a session layer communications service used by client and server applications in a distributed data processing system. NetBIOS was created by IBM for its early PC networks and has become a de facto industry standard. NetBIOS may generate Ethernet, Token Ring, and SDDI as well as other MAC (media access control) level protocols. NetBIOS has been implemented for many operating systems including Microsoft Windows NT, IBM OS/2, DOS, etc. NetBIOS does not, in itself, support a routing mechanism, and applications communicating on a WAN must use another "transport mechanism", such as TCP, rather than, or in addition, to NetBIOS.

NetBIOS provides application programming interfaces (APIs) that free an application or driver from containing code that understands the details of the network, including error recovery in session mode. A NetBIOS request is provided in the form of a Network Control Block (NCB) which, among other things, specifies a message location and the name of a destination. NetBIOS provides the session and transport services described in the Open Systems Interconnection (OSI) model. However, it does not provide a standard frame or data format for transmission. The standard frame format is provided in the NetBIOS Extended User Interface (NetBEUI).

NetBIOS provides two communication modes: session or datagram. Session mode lets two computers establish a connection for a "conversation", allows larger messages to be handled, and provides error detection and recovery.

Datagram mode is "connectionless", i.e. each message is sent independently. In datagram mode, messages must be smaller, and the application is responsible for error detection and recovery. Datagram mode also supports the broadcast of a message to every computer on the LAN.

NetBIOS provides applications with a programming interface for sharing services and information across a variety of lowered-layer network protocols including IP, IPX, and NetBEUI. There are three categories of NetBIOS services: the name service, the session service, and the datagram service. The NetBIOS name service allows an application to verify that its own NetBIOS name is unique. The application issues an "add name" query to NetBIOS. NetBIOS broadcasts the "add name" query containing the name. NetBIOS applications that receive the query return an "add name" response or a "name-in-conflict" response. If no response to the query is received (typically after six broadcasts staggered in time), the name is considered to be unique. The NetBIOS name service also allows an application to delete a NetBIOS name that the application no longer requires, and it allows an application to use a server's NetBIOS name to determine the server's network address. The application issues a "name query" request to NetBIOS containing the target server's NetBIOS name, for which NetBIOS broadcasts the "name query" request. The server that recognizes the name returns a "name query" response containing its network address.

The NetBIOS session service allows an application to conduct a reliable, sequenced exchange of messages with

another application. The messages can be up to 131,071 bytes long. The NetBIOS datagram service allows an application to exchange datagrams with a specific application or to broadcast datagrams to a group and receive datagrams from the group. Datagrams allow applications to communicate without establishing a session. When a NetBIOS application wants to send information that does not require acknowledgement from the destination application, the application can transmit a NetBIOS datagram.

TCP is another network protocol that provides reliable sequenced data transfer between local or remote hosts. TCP communicates program to program, not machine to machine. It works by opening up a stream or virtual circuit between the two ports, which begins by alerting the receiver to expect information and ends by an explicit termination signal. It guarantees that data reaches its destination and re-transmits any data that did not get through.

TCP is responsible for taking the desired information and breaking it into manageable chunks. TCP creates segments or user datagrams by taking the information from the application layer and adding a header to it. Each piece is numbered so a receipt can be verified and so the data can be put back into the proper order. If some pieces are missing, it asks the sender to send them again. Once it has all the information in the proper order, it passes the data to whatever application program is using its services. Since every segment received is answered with an acknowledge, TCP is a

reliable stream delivery service—either the information is "guaranteed" to arrive, or an error will be returned.

With reference now to **Figure 5**, a block diagram depicts software components within a server that provide for multiple network names on the server. Application **501**, application **502**, and application **503** execute on host computer **506** to provide a variety of data processing services. One of these applications may include third party software that enhances a user's ability to configure server **500** for a variety of enterprise applications, such as migration of servers or fail-over recovery. Application data files **504** may contain data storage for applications **501-503**. Operating system data files **505** for host computer **506** may keep various types of information necessary to the proper functioning of the computer may be kept. One of the data files within operating system data files **505** may be server configuration file **507** that contains configuration parameters **508** and **509**. In this example, server **500** is shown configured with a single server name. Alternatively, the configuration parameters may be stored in an initialization file, such as a .INI file.

Server **500** may have a variety of modules within it. These modules may be logical groupings of data structures and functions or APIs for performing various duties. Logical separation and inclusion of software within a computer in this manner is well known in the art. Server initialization module **510** initializes or configures server **500** by reading various files, such as server configuration file **507**. User administration module **511**

contains data structures **512** and APIs **513-515** for providing maintenance of user information and accounts on server **500**. Various input and output devices that are not shown in **Figure 5** may provide user interaction capabilities for server **500** and applications **501-503**.

Share administration module **527** has data structures **528** and APIs **529-531** that provide registration and use of various shares within the network environment. Session administration module **532** has data structures **533** and APIs **534-536** that provide registration and use of sessions within the network environment.

Network services administration module (NSAM) **537** has data structures **538** and APIs **539-541** that provide access to an operating system interface for network services. NSAM **537** is similar to the NSAMs shown in **Figure 4**. While share administration module **527** and session administration module **532** rely heavily on the use of NSAM **537** for linking server **500** with another computer on the LAN, they are not primarily concerned with network communication.

Data structures **538** contain server name table **542** that contains a set of server names, such as primary server name **543** and secondary server names **544-546**. The set of server names in server name table **542** may comprise a primary server name and a large, variable number of secondary server names. Only one primary name may be registered per server, but multiple secondary names may be registered per server.

With reference now to **Figure 6**, a flowchart shows a method in which a single computer may be configured with

multiple network names. At some point in time, a server will begin an initialization or configuration process (step **602**) during which the server will open and read parameters from a server configuration file (step **604**). These parameters may include a variety of data items necessary for the proper configuration of the server.

The server reads a next configuration parameter from the configuration file (step **606**) and determines whether the configuration parameter specifies a primary server name (step **608**). If so, the primary server name is registered with the Network Services Administration Module (NSAM) (step **610**). The process then continues through a loop in which it is determined whether more configuration parameters are contained within the configuration file (step **618**). If so, then the process loops back to step **606** to obtain the next configuration parameter.

If the configuration parameter was not a primary server name, a determination is made whether the configuration parameter specifies a secondary server name or names (step **612**). If so, the secondary server name or names are registered by the NSAM (step **614**) and the process continues to step **618**. If the configuration parameter does not specify a secondary server name, then the configuration parameter does not specify a server name, and the configuration parameter is processed in some other manner appropriate for the type of configuration parameter (step **616**). Various types of configuration parameters may be stored in the server configuration file that are server-specific. For

example, a server that processes business inventory may store information concerning the locations of inventory databases within the server configuration file. The server may read pathname parameters for these databases from the server configuration file and store the pathnames in the appropriate data structures.

The process then continues, at step **618**, to check whether other configuration parameters within the configuration file still need to be processed. If not, the server completes the initialization process (step **620**). The configuration file should include at least one server name.

Referring back to **Figure 5**, an example of a single server name for a computer is shown within Server configuration file **507** and server name table **542**. During the initialization process described in **Figure 6**, server initialization module **510** would read server configuration file **507** and process configuration parameters within the file. Server configuration file **507** shows configuration parameter **508** named "srvname" with a value equal to "alpha". Server configuration file **507** also contains configuration parameter **509** named "othsrvnames" with a value set to the null string. When server initialization module **510** reads these parameters, it will register the server names found in server configuration file **507** with NSAM **537** which then stores the server names within server name table **542**. As is shown in **Figure 5**, the primary server name stored in server configuration file **507** is the same as the primary server name **543** within server name table **542**. In this case, server initialization

module **510** has read the server name "alpha" and registered the server name with NSAM **537**. The server name may be registered through the calling of the appropriate API within NSAM **537**, such as one of the APIs **539-541** that provides for registration of a primary server name.

With reference now to **Figure 7**, a block diagram depicts a single server configured with multiple network names. **Figure 7** is similar to **Figure 5** and similar reference numerals within each figure label similar components. However, the server configuration file now contains a parameter **750** for other server names with a value equal to the string "theta&omega". The server name table also contains newly added secondary server names in which SecondaryServerNameA **751** has a value equal to "theta" and SecondaryServerNameB **752** has a value equal to "omega". In this case, the server initialization module has configured the server by reading multiple network names from the server configuration file and registering the multiple names with the NSAM by calling one of the APIs **539-541** that provides for registration of a server name.

With reference now to **Figure 8**, a flowchart depicts a process of using multiple network names on a single server to provide data processing services to a client. The process begins when the host computer executes various applications including a server application (step **802**). The NSAM on the host computer monitors the network traffic in the background (step **804**) until it must determine whether a message/datagram is addressed to a

registered primary or secondary server name on the host computer (step **806**). If so, the NSAM retrieves the message/datagram containing an API call (step **808**) and invokes the requested API that has been directed to the registered server name (step **810**). The host computer executes the API within the appropriate server name context (step **812**). The API function generates data/status for a client (step **814**) and returns a message/datagram that includes the proper indication of the server name context in which the API call was executed (step **816**). The NSAM sends the message/datagram to the client (step **818**), and the client receives the message/datagram without being aware of the physical host computer that executed the API call (step **820**). The process then continues with the NSAM continuing to monitor the network traffic (step **824**). If the previous message or datagram was not addressed to a registered primary or secondary server name on the host computer, then the NSAM does not process the message/datagram (step **822**). The NSAM then determines whether it should continue to monitor the network traffic (step **824**). If so, then the process loops back to step **804**. Otherwise, the process terminates.

With reference now to **Figures 9A-9D**, a simplified network diagram provides an example of using multiple network names for a single server. LAN **900** connects clients **901** and **902** with servers **904** and **905**. Servers **904** and **905** access shared disk **906**. Server **904** has network name "Customers", and server **905** has network name "Inventory". The servers may be monitored by a special

application on either server that provides fail-over monitoring capabilities. If so, server **904** and server **905** may be configured to provide active/active redundancy, also known as bi-directional fail-over. In this configuration, mission-critical applications may run on two fully functioning servers that can each stand in for the other when either server fails.

Figure 9B shows the first step toward recovery in a situation where one server fails and another server assumes the responsibilities of the failed server. In this example, the "Inventory" server may be experiencing some type of hardware problem that either requires intervention in order to shutdown the server or automatically causes the server to shutdown. In either of those cases, server **905** eventually loses communication with local area network **900**. This failure does not immediately effect the "Customers" server.

Figure 9C shows that server **905** is still disconnected from local area network **900**, and server **904** has been disconnected from local area network **900** in order to reconfigure the "Customers" server to assume the duties of the failed "Inventory" server.

Server **904** may be reconfigured in a variety of manners. In a manual reconfiguration process, a system administrator may have been manually monitoring the performance of the servers and noticed the shutdown of server **905** or was alerted in some manner of the shutdown of server **905**. The system administrator may use a command line interface or graphical user interface in order to input commands to server **904** that will

disconnect it from the local area network and begin a reconfiguration process. The system administrator may input the commands and receive display information from input and output devices connected to server **904** that are not shown in **Figures 9A-9B.**

In order for server **904** to assume the responsibilities of server **905**, server **904** must be given the network name of server **905** so that it may respond to processing requests, e.g., from clients **901** and **902** across local area network **900**, that previously would have been processed by server **905**. The system administrator may add the previous network name of server **905**, i.e. "Inventory", to the configuration file of server **904**. Server **904** previously had a sole server name, i.e. a primary server name of "Customers," and the system administrator places a secondary server name of "Inventory" in the configuration file of server **904**. The new server name may be added to the configuration file either by simple text editing of the configuration file or through some system utility provided for this purpose.

At some point, server **904** is restarted or halted/stopped and restarted. The server initialization module on server **904** will read the primary and secondary server names from the configuration file and register these network names in the server name table of the network services administration module of server **904**. At that point, server **904** is ready to recognize server requests, e.g., requests from clients on the local area network, for both server "Customers" and server "Inventory".

Instead of a manual process for reconfiguring server **904**, some type of system program or third party software may monitor the fail-over condition of servers **904** and **905** specifically for the failure of one of the servers so that the other server may be automatically reconfigured. In this case, the failure of server **905** is automatically detected, and the fail-over software automatically begins the reconfiguration process for server **904**. In the example of **Figure 9C**, the "Inventory" server fails and the "Customers" server is automatically disconnected from local area network **900**. The fail-over software may also bring down other applications as necessary that may have been executing on server **904** when the determination was made to reconfigure it. The fail-over software must enable server **904** to recognize the server name of failed server **905**. The fail-over software may insert the "Inventory" server name of failed server **905** as a secondary server name in the configuration file of server **904** and then bring reconfigured server **904** back on-line.

Figure 9D shows the result of reconfiguring server **904** to recognize multiple network names on a single server. Server **904** has been reconfigured to recognize its original primary server name "Customers" and a new secondary server name "Inventory" that matches the previously used primary network name of server **905**, i.e. "Inventory". Server **904** has been reconfigured either through a manual process from a system administrator or through an automatic reconfiguration process from a fail-over application executing on server **904**. In either case, server **904** may be given the additional network name

by placing a secondary server name in its configuration file and bringing it back on-line. Server **904** may be reconnected to local area network **900** by restarting the network services administration module in a manner which allows communication to be reestablished between server **904** and clients **901** and **902** as shown in **Figure 9D**.

Server **904** has access to the information previously stored by server **905** on shared disk **906**. Alternatively, server **904** has access to a copy or replica of the information previously stored by server **905**. Coherency and synchronization techniques for replicating files and disks are well-known in the art. When a client sends a request to the server named "Inventory", the appropriate application on server **904** may access inventory-related information on shared disk **906** and respond appropriately to the requesting client. Server **904** may also continue its responsibilities responding to requests for server name "Customers". Depending on the amount of time spent reconfiguring server **904**, a user on either client **901** or client **902** may experience only minor interruptions in responses received from servers on local area network **900** that respond to their requests.

With reference now to **Figures 10A-10C**, simplified network diagrams depict a migration scenario in which a server that is initially configured to respond to multiple server names is reconfigured so that multiple servers may respond to those server names. **Figure 10A** shows local area network **1000** connecting client **1001**, client **1002**, and server **1003**. Server **1003** has a primary server name of "Accounts" and a secondary server name of

"Personnel". Server **1003** responds to requests from clients **1001** and **1002** using these multiple server names. Clients **1001** and **1002** are not aware that the server named "Accounts" and the server named "Personnel" are actually a single physical host computer shown supporting server **1003**.

Figure 10B shows the introduction of a new server **1004** that is already configured with a primary server name of "Personnel". Server **1004** has not yet been connected to local area network **1000**, and server **1003** has been disconnected from local area network **1000** in order to reconfigure it so that it stops responding to requests directed to a server named "Personnel".

Server **1003** may be reconfigured in either a manual or an automatic process. If a manual process is being used to reconfigure server **1003**, a system administrator may remove the secondary server name "Personnel" from the configuration file of server **1003** and then restart server **1003** or restart its network services administration module in order to reestablish a communication link between server **1003** and local area network **1000**. If an automatic process is used to reconfigure server **1003**, a system utility or some type of server-migration software application may be used to automatically take server **1003** off-line, change its reconfiguration file to remove a secondary server name, and then reestablish communications between server **1003** and local area network **1000**.

Figure 10C shows a network configuration in which communications have been reestablished between server

1003 and local area network **1000**, and server **1004** has been connected to local area network **1000** and brought on-line. Server **1003** has been reconfigured so that it responds only to client requests directed to a server named "Accounts". Server **1004** responds to requests directed to a server named "Personnel". In this manner, some of the processing responsibilities of server **1003** have been migrated to server **1004** without effecting the manner in which clients **1001** and **1002** request and receive data. Clients **1001** and **1002** are not aware that the servers named "Accounts" and "Personnel" originally resided on a single physical host computer and have been readjusted so that server "Accounts" and server "Personnel" reside on two physical host computers connected to the same local area network.

This type of migration scenario may be required when the processing load on server **1003** becomes too great through the addition of demanding clients to the local area network. By splitting the servers across multiple host computers, a system administrator may provide better response times to customers or employees using enterprise applications across the local area network. The disruption caused by the temporary disconnect of server **1003** from the local area network may be rather minor depending on the amount of time used to reconfigure server **1003**. The amount of downtime or inconvenience noticed by users of clients **1001** and **1002** may be minimized through the use of automatic reconfiguration software that facilitates the migration of servers from

one computer or another using the mechanism of multiple network names for a single server described above.

With reference now to **Figure 11**, a block diagram depicts the system components for a host computer whose capabilities have been extended to include the dynamic addition and removal of multiple network names on a single server. **Figure 11** is similar to **Figures 5** and **7**, and similar numerals in each figure represent similar system components within the server. However, new network APIs **1101-1103** have been added to NSAM **537** that already contained APIs **539-541**. NetServerNameAdd **1101**, NetServerNameDel **1102**, and NetServerNameEnum **1103** provide operating system capabilities for adding, removing, and enumerating dynamic, multiple server names so that applications may call these APIs to perform server name context functions in server **500** "on the fly". In other words, the system capabilities are extended by incorporating APIs that dynamically modify the membership of a set of server names for the server. Alternatively, the services performed within the APIs may also be performed by procedures, functions, methods, objects, and subroutines within the system.

The NetServerNameAdd(server,name) API will instruct a server named in the "server" parameter to begin responding to requests for the specified server name in the "name" parameter. The NetServerNameDel(server,name) API will instruct the server named in the "server" parameter to stop responding to requests for the specified server name in the "name" parameter, i.e. "delete" the server name. The NetServerNameEnum(server)

API will return a list of network names to which the server named "server" is responding, i.e. "enumerate" the server names.

With reference now to **Figure 12**, a flowchart depicts the manner in which APIs may be used for dynamic addition and removal of multiple network names on a single server. The process begins when a host computer is configured to include APIs for adding, deleting, and enumerating multiple server names on a physical host computer (step **1202**). For example, these APIs may include NetServerNameAdd, NetServerNameDel, and NetServerNameEnum as described with respect to **Figure 11**. Other APIs may be provided that use a different syntax or provide some other equivalent manner of dynamically modifying the set of multiple network names for a single server.

These APIs may be logically grouped and referred to as MultipleServerName APIs. MultipleServerName APIs are invokable locally or remotely according to the target server specified as a server name parameter in a particular invocation of a MultipleServerName API (step **1204**). In other words, an application on the host computer may call one of the MultipleServerNames APIs with a server name parameter that will direct the execution of the APIs to either execute locally on the same host computer or direct the APIs to execute on a remote computer that is identifiable by the target server name.

The specification of the location for the execution for an API may be performed in a variety of ways. For example, the LAN Server network application programming

interface allows for most all of its network API calls to specify a pointer to a server name as the first field in the API parameters. If the pointer to the server name is NULL or a null string, then the API executes at the local machine; otherwise, the server name pointer points to a string containing the name of the machine at which the API call should execute. In this manner, the server name allows for a type of remote procedure calling (RPC) convention.

A determination is made as to whether the host computer has received an invocation of a MultipleServerName API (step **1206**). If so, a further determination is made as to whether the target server name specified as a parameter in the API call matches a registered server name on the host computer (step **1208**). If so, then the MultipleServerName API executes locally on the host computer to update or get registered server name information on the host computer (step **1210**). If there is no match between the target server name specified as the parameter in the MultipleServerName API and a registered server name on the host computer, the NSAM then sends the MultipleServerName API onto the network to direct the API call to a remote server (step **1212**). After the host computer processes the local invocation of the MultipleServerName API, the process continues with a determination as to whether the host computer should continue processing or is being shut down (step **1218**). If the host computer is to continue processing, the method loops back to step **1206**.

If the host computer has not received a local invocation of a MultipleServerName API, the NSAM continues to monitor the network traffic and attempts to determine whether a message/datagram directed to a server name on the host computer includes a MultipleServerName API for a registered server name on the host computer (step **1214**). If so, then the MultipleServerName API is invoked on the host computer, which updates or gets registered server name information on the host computer (step **1216**). If not, the process continues to step **1218** to continue the loop for general monitoring of events.

The utility of having a set of MultipleServerName APIs for dynamically adding and removing multiple network names for a single server may be shown with reference again to **Figures 9C** and **10B**. In **Figure 9C**, using the previous method, server **904** was reconfigured in a manual or an automatic process in which an additional network name was added to server **904**. In **Figure 10B**, using the previous method, server **1003** was reconfigured to remove a secondary server name that was then added to a new server **1004**. In each of these cases, a server name was added or removed through the use of a configuration file that required a restart of the server containing the configuration file. Configuration parameters within the configuration file included the primary and secondary server names that were read by a server initialization module that registered the server names with the network services administration module. The use of the configuration file for storing primary and secondary server names is a rather "static" mechanism for changing

the network names to which the host computer will respond.

The MultipleServerName APIs shown in **Figure 11**, and further described in the method depicted in the flowchart of **Figure 12**, allow dynamic addition and removal of server names without the cumbersome process of editing or changing a configuration file. The use of a configuration file requires the disconnect and subsequent reconnect of a server from the local area network and the temporary disruption of services to the client on the local area network.

With reference now to **Figures 13A-13D**, a simplified network diagram depicts a method of providing bi-directional fail-over capability using the dynamic addition and removal of multiple network names for a single server according to the present invention. **Figures 13A-13D** are similar to **Figures 9A-9D** except that the server names in **Figures 13A-13D** may be reconfigured dynamically rather than statically as shown in **Figures 9A-9D**.

In **Figure 13A**, LAN **1300** connects clients **1301** and **1302** with servers **1304** and **1305**. Servers **1304** and **1305** access shared disk **1306**. Server **1304** has network name "Customers", and server **1305** has network name "Inventory". The servers may be monitored by a special application on either server that provides fail-over monitoring capabilities. If so, server **1304** and server **1305** may be configured to provide active/active redundancy, also known as bi-directional fail-over. In this configuration, mission-critical applications may run

on two fully functioning servers that can each stand in for the other when either server fails.

Figure 13B shows the first step toward recovery in a situation where one server fails and another server assumes the responsibilities of the failed server. Server **1305** eventually loses communication with local area network **1300**.

Figure 13C shows that server **1305** is still disconnected from local area network **1300**. However, server **1304** remains connected to local area network **1300** while being reconfigured to assume the duties of the failed "Inventory" server in addition to the duties of the "Customers" server.

Server **1304** may be reconfigured in a variety of manners. In a manual reconfiguration process, a system administrator may have been manually monitoring the performance of the servers and noticed the shutdown of server **1305** or was alerted in some manner of the shutdown of server **1305**. The system administrator may use a command line interface or graphical user interface in order to input commands to server **1304** that begin a reconfiguration process. The system administrator may input the commands and receive display information from input and output devices connected to server **1304** that are not shown.

In order for server **1304** to assume the responsibilities of server **1305**, server **1304** must be given the network name of server **1305** so that it may respond to processing requests, e.g., from clients **1301** and **1302** across local area network **1300**, that previously

would have been processed by server **1305**. Either by commands from the system administrator or through some type of fail-over software, an API discussed in **Figure 12** may be called in order to dynamically add an additional network name for the server. At that point, server **1304** is ready to recognize server requests, e.g., requests from clients on the local area network, for both server "Customers" and server "Inventory".

Figure 13D shows the result of reconfiguring server **1304** to recognize multiple network names on a single server. Server **1304** has been reconfigured to recognize its original primary server name "Customers" and a new secondary server name "Inventory" that matches the previously used primary network name of server **1305**.

With reference now to **Figures 14A-14C**, a simplified network diagram depicts an environment in which a migration scenario may be implemented using the method for dynamic addition and removal of multiple network names on a single server according to the present invention. **Figures 14A-14C** are similar to **Figures 10A-10C** except that the server names in **Figures 14A-14C** may be reconfigured dynamically rather than statically as shown in **Figures 10A-10C**.

Figure 14A shows local area network **1400** connecting client **1401**, client **1402**, and server **1403**. Server **1403** has a primary server name of "Accounts" and a secondary server name of "Personnel". Server **1403** responds to requests from clients **1401** and **1402** using these multiple server names. Clients **1401** and **1402** are not aware that the server named "Accounts" and the server named

"Personnel" are actually a single physical host computer shown supporting server **1403**.

Figure 14B shows the introduction of a new server **1404** that is already configured with a primary server name of "Personnel". Server **1404** has not yet been connected to local area network **1400**.

In order for server **1404** to assume some of the responsibilities of server **1403**, server **1403** must relinquish its server name "Personnel". In order to dynamically change the set of server names on server **1403**, an API discussed in **Figure 12** may be called in order to dynamically remove a network name for the server.

Server **1403** may be reconfigured in either a manual or an automatic process. If a manual process is being used to reconfigure server **1403**, a system administrator may use a command line interface or graphical user interface in order to input commands to server **1403** that begin a reconfiguration process. The system administrator may use input and output devices connected to server **1403** that are not shown. If an automatic process is used to reconfigure server **1403**, a system utility or some type of server-migration software application may be used to remove a secondary server name. In either case, an API would be called in response to the manually entered commands or the automated process. The API dynamically removes the server name "Personnel" from server **1403** without restarting server **1403** or its host computer.

Figure 14C shows a network configuration in which server **1403** has been reconfigured, and server **1404** has been connected to local area network **1400** and brought on-line. Server **1403** has been reconfigured so that it responds only to client requests directed to a server named "Accounts". Server **1404** responds to requests directed to a server named "Personnel". In this manner, some of the processing responsibilities of server **1403** have been migrated to server **1404** without effecting the manner in which clients **1401** and **1402** request and receive data, i.e. server **1403** has been reconfigured "on the fly". Server **1403** was not disconnected from network **1400** in order to perform the reconfiguration. Clients **1401** and **1402** are not aware that the servers named "Accounts" and "Personnel" originally resided on a single physical host computer and have been readjusted so that server "Accounts" and server "Personnel" reside on two physical host computers connected to the same local area network.

Figures 5-14 describe a method and system in which a single server may be known on the network by more than one name. However, other system support for multiple server names should be provided in order to address usability concerns that may arise and cause inconveniences for a network administrator or user. These types of concerns would not be present when a server may have only a single server name.

For example, assume that multiple network names have been registered for a single server. If resource share names are created on the server, they could be visible from and available to a client connected to any of the

server names in use on the host computer. Unless this concern is addressed, there would be no control over which shares would be visible under a specific server name. Also, if one displays or administrates server sessions, the sessions to a specific server name could not be displayed or deleted—one would only be able to display and delete all sessions on the specific server name or to display or delete the first session matching the workstation name.

Figures 15-19 describe a method and system for resolving usability issues by having the server name that is supplied in an API call also be an indicator for a server name context in which the API should execute when more than one server name is in use on the host computer. The disclosed method uses the server name to generate a unique tag that is associatively stored in all of the resource data structures requiring separation of the resource by server name, such as shares and sessions. In following examples, the tag is a bitmask. However, other types of tags based on a server name may be used to create a server name context.

When a share is created, if the server name is provided in the network API call, then a unique bitmask is generated and stored in the appropriate data structure that requires it. The bitmask is essentially a bit index into an array of server names. A special mask of -1 (or all bits set in the bitmask) is used when no server name is provided in the API call parameters, e.g., a local call with a null string for a server name, to indicate the operation is to apply to all the server names.

For example, assume that the following API call is used to create a new share:

```
rc = NetShareAdd(" ",2,pBuffer,usBuflen);
```

This API call will create a share that will be visible across all server names, i.e. the share will have a server name mask of -1.

In another example, the same API call may specify one of the server names in use:

```
rc = NetShareAdd("\\\\GUNSLINGER",2,pBuffer,usBuflen);
```

Since the API call contains a parameter that specifies the server name, the API will be executed remotely at server "\\GUNSLINGER", or if the host computer at which the API is being invoked has a server named "GUNSLINGER", then the API will be executed locally. Either way, the "server name aware" NetShareAdd() API will convert the server name to the server name mask with which to associate the share.

In another example, assume that the following API call is invoked from a client:

```
rc = NetShareEnum("\\\\GUNSLINGER",0,pBuffer,usBuflen,
&usEntriesReturned,&usEntriesAvailable);
```

The results of the share enumeration call stored as the buffer contents will contain only share names for shares

for the server name "\\GUNSLINGER" and shares applicable to all server names.

The utility of enabling an API to work in the context of a particular server name can be extended to other network APIs that accept the remote server name as a parameter of the API call. As an example, the NetSessionEnum() API can be made multiple server name aware by having it convert the supplied server name string to a unique server name mask and bitwise ANDing it with a server name mask stored in the server session data structure corresponding to the server name with which the session was established.

For example, assume that the following API call is used to enumerate the sessions of a server:

```
rc = NetSessionEnum("\\\\GUNSLINGER",0,pBuffer,usBuflen,
&usEntriesReturned,&usEntriesAvailable);
```

The results of the session enumerate call would include only sessions established to server name "\\GUNSLINGER" and nothing else. Executing the same call with a null string server name would proceed to return all sessions established with all of the local server names.

If no server name is provided and the API is issued locally, then the information returned may be for shares, device queues, or sessions that exist across all server names. If name conflicts exist, such as two shares with the same name on different server names, the API may act on the first match it finds when no server name has been provided.

With reference now to **Figure 15**, a flowchart depicts a method for enabling a network application programming interface to function in the context of one or all server names in a multiple server name environment. The process begins when an application on the host computer calls a network API (step **1502**). A determination is made as to whether the API call contains a server name as a parameter (step **1504**). If so, then a further determination is made as to whether the specified target server name matches a registered server name on the host computer (step **1506**). If not, then the API call is placed on the network and directed to the remote server specified in the API call (step **1508**). The process is then completed for this type of API call.

If the specified target server name does match a registered server name on the host computer, then a server-specific name mask is generated that corresponds to the server name in the API call (step **1510**). If the API call does not contain a server name as a parameter, then a server-generic name mask is generated (step **1512**). A determination is then made as to whether the API call corresponds to an add operation for some type of server resource or service (step **1514**). If so, then a new entry is created in the appropriate server module's data structure or table (step **1516**). The generated name mask is then stored in the new entry along with any other information required by the module for this newly added resource or service (step **1518**). If the API call does not correspond to an add operation, then the name mask is used to filter or retrieve associated server information

from entries in a server module's data structure or table (step **1520**).

With reference now to **Figure 16**, a diagram depicts a data structure for separating share resources by server name within a context of one or all server names in a multiple server name environment. Share administration module **1600** and data structures **1601** are similar to share administration module **527** and data structures **528** shown in **Figure 5**, whereas **Figure 16** provides further details for those elements shown in **Figure 5**.

Share table **1602** may be one of a plurality of data structures within share administration module **1600**. Share table has a number of entries that comprise records of information for each share being supported by share administration module **1600**. The first share depicted in share table **1602** has a name ShareName_A **1603** with a resource type **1604** and associated server name mask **1605**. Another entry in share table **1602** has ShareName_B **1606** with resource type **1607** and associated server name mask **1608**. Further detail of server name mask **1608** has been expanded in the figure to show individual server name mask bits **1609-1616** which correspond uniquely to entries in **1617-1624** in the server name table within the NSAM data structures. In this example, bit **1615** is set to indicate that share **1606** is applicable or available only to the server with the server name "theta" stored in entry **1618** in the server name table.

With reference now to **Figure 17**, a diagram depicts a data structure for separating session resources by server name within a context of one or all server names in a

multiple server name environment. Session administration module **1700** and data structures **1701** are similar to session administration module **532** and data structures **533** shown in **Figure 5**, whereas **Figure 17** provides further details for those elements shown in **Figure 5**.

Session table **1702** may be one of a plurality of data structures within session administration module **1700**. Session table has a number of entries that comprise records of information for each session being supported by session administration module **1700**. The first session depicted in session table **1702** has a client name ClientName_A **1703** with associated server name mask **1704**. Another entry in session table **1702** has client name ClientName_B **1705** with associated server name mask **1706**. Further detail of server name mask **1706** has been expanded in the figure to show individual server name mask bits **1707-1714** which correspond uniquely to entries in **1715-1722** in the server name table within the NSAM data structures. In this example, bit **1713** is set to indicate that session **1706** is established or connected only to the server with the server name "theta" stored in entry **1716** in the server name table.

With reference now to **Figure 18**, a flowchart depicts a method for generating the name masks for use in the server modules for identifying a server name context for the execution of APIs in those modules when more than one server name is in use on the physical server machine. A common routine may be provided to convert the supplied server name to a server name bitmask for bitwise AND operations for server name context processing.

The process begins when a module requires the generation of a server-specific name mask that corresponds to a server name parameter in an API call (step **1802**). The server module that requires the name mask may request the NSAM to generate a name mask based upon a supplied server name (step **1804**). The module may make this request through an exchange of messages or through an API call within the NSAM. The NSAM then searches the server name table within the NSAM data structures for a matching server name (step **1806**). It may be assumed that the NSAM will match at least one server name in an entry of the server name table with the requested server name given that the requesting module would not be processing the original API call if the server name in the original API call was not a valid registered server name on the host computer. The NSAM gets the index value X of a matching entry in the server name table of size N with an index range of [0..(N-1)] (step **1808**). The name mask is then given a value that equals 2^X (step **1810**). This name mask value sets a unique bit within the set of bits. The NSAM then returns the name mask to the calling module (step **1812**). The module then uses the name mask to store or retrieve proper server context information for the specified server name in the original API call (step **1814**).

With reference now to **Figure 19**, a flowchart depicts a name mask used to retrieve or filter information associated with particular server name contexts when more than one server name is in use upon a physical server machine. The process begins when an API within an server

module is called remotely or locally with or without a server name to retrieve or filter information associated with a server context (step **1902**). The API code requests the generation of a name mask for the server name specified in the API call (step **1904**) and retrieves the server name mask from a first entry within the appropriate data structure or table in the server module (step **1906**). The API then bitwise ANDs the server name mask of the entry with the previously generated name mask (step **1908**). A determination is made as to whether the result of the AND operation is non-zero (step **1910**). If so, then the proper bit is set within the server name mask, and the information within the entry of the data structure is retrieved based on its association with the proper server context identified by the associated server name mask (step **1912**). The process then continues by checking for more table entries that may have other information associated with the server name given in the original API call (step **1914**). If the result of the AND operation is equal to zero, then the table entry does not contain information associated with the proper server context, and the process continues with the determination as to whether other table entries need to be checked (step **1914**). If so, then the process loops back to step **1906** to check other data structure entries. If not, then the API returns any information retrieved for the server context as a resulting return value from the API call (step **1916**).

Creating server name contexts for the execution of various APIs allows for better administration of server

resources across multiple server names even though the multiple server names are on the same physical host computer. The server name contexts also provide a more robust and less confusing view of the server from a client perspective. While the server name contexts do not provide a full implementation of a virtual server, in which each server name would look like a totally different server from the client perspective, the different contexts provide a much more usable server when implementing multiple server names.

The disclosed method can be rapidly implemented without much disruption. The implementation described above does not require application changes in the calling of the API with the exception of supplying the server name, which most clients already perform when invoking APIs to indicate the server to which the operation should apply.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

CLAIMS:

What is claimed is:

1. A method for executing a function on a server in a distributed data processing system, the method comprising the computer-implemented steps of:

receiving a request for a function, wherein the request comprises an input specifying a server name, wherein the server responds to requests directed to a set of server names; and

executing the function in a server name context on the server as directed by the input specifying the server name.

2. The method of claim 1 wherein the server name context on the server comprises a set of resources associated with a server name.

3. The method of claim 2 further comprising identifying a membership of a resource within the set of resources for the server name context.

4. The method of claim 3 further comprising generating a server name tag for the server name, wherein the membership of the resource in the set of resources is identifiable by the server name tag associatively stored with the resource.

5. The method of claim 4 wherein the server name tag is generated based on a value of the server name and a value derived from a data structure that stores the server name.

6. The method of claim 5 wherein the value derived from the data structure is a position value of the server name within a server name table that stores the set of server names.

7. The method of claim 1 wherein the request for the function is received from a network.

8. The method of claim 1 further comprising:

locating the server name in an entry of a server name table;

obtaining a location index for the entry; and

generating a server name mask based on the location index.

9. The method of claim 1 further comprising:

generating a server name mask based on the server name;

retrieving a server name mask for a resource from a resource data structure; and

comparing the generated server name mask with the retrieved server name mask to identify whether the resource is applicable to the server name.

10. The method of claim 9 further comprising:

repeatedly identifying a plurality of resources that are applicable to the server name by searching a plurality of resource data structures for matching server name masks.

11. The method of claim 9 wherein the comparison of server name masks is a bitwise AND operation.

12. A data processing system comprising:

means for receiving a request for a function, wherein the request comprises an input specifying a server name, wherein the server responds to requests directed to a set of server names; and

means for executing the function in a server name context on the server as specified by the input containing the server name.

13. The data processing system of claim 12 wherein the server name context on the server comprises a set of resources associated with a server name.

14. The data processing system of claim 13 further comprising identification means for identifying a membership of a resource within the set of resources for the server name context.

15. The data processing system of claim 14 further comprising generation means for generating a server name tag for the server name, wherein the membership of the

resource in the set of resources is identifiable by the server name tag associatively stored with the resource.

16. The data processing system of claim 15 wherein the server name tag is generated based on a value of the server name and a value derived from a data structure that stores the server name.

17. The data processing system of claim 16 wherein the value derived from the data structure is a position value of the server name within a server name table that stores the set of server names.

18. The data processing system of claim 12 further comprising:

locating means for locating the server name in an entry of a server name table;

obtaining means for obtaining a location index for the entry; and

generating means for generating a server name mask based on the location index.

19. The data processing system of claim 12 further comprising:

generating means for generating a server name mask based on the server name;

retrieving means for retrieving a server name mask for a resource from a resource data structure; and

comparing means for comparing the generated server name mask with the retrieved server name mask to identify whether the resource is applicable to the server name.

20. The data processing system of claim 19 further comprising:

repeatedly identifying a plurality of resources that are applicable to the server name by searching a plurality of resource data structures for matching server name masks.

21. A computer program product on a computer readable medium for use in a data processing system, the computer program product comprising:

first instructions for receiving a request for a function, wherein the request comprises an input specifying a server name, wherein the server responds to requests directed to a set of server names; and

second instructions for executing the function in a server name context on the server as specified by the input containing the server name.

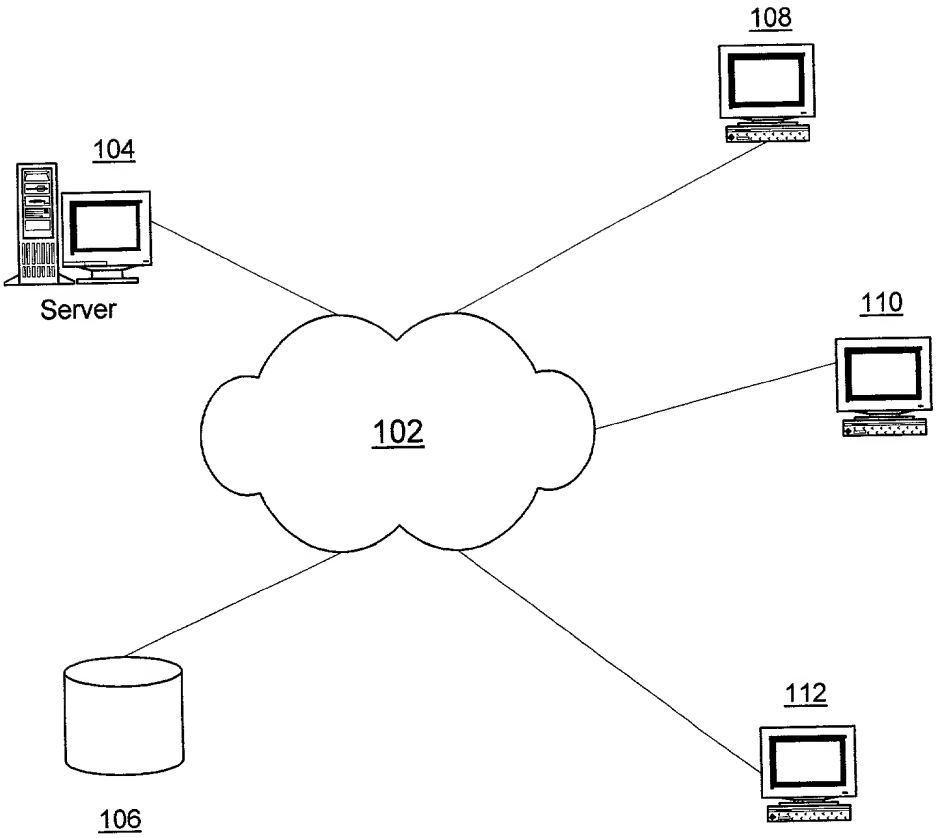
22. The computer program product of claim 21 wherein the server name context on the server comprises a set of resources associated with a server name.

Docket No. AT9-98-737

ABSTRACT OF THE DISCLOSURE

METHOD AND SYSTEM FOR ENABLING A NETWORK FUNCTION IN A CONTEXT OF ONE OR ALL SERVER NAMES IN A MULTIPLE SERVER NAME ENVIRONMENT

A method for executing a function on a server in a distributed data processing system is provided. The server responds to requests directed to a set of server names. A function request has an input that specifies a server name in the set of server names. The function is executed on the server in a server name context specified by the input containing the server name. The server name context on the server has a set of resources associated with a server name. A unique server name tag is generated for each server name in the set of server names, and each resource in the set of resources is identifiable by the server name tag associatively stored with the resource.



100

Network

Figure 1

AT9-98-737

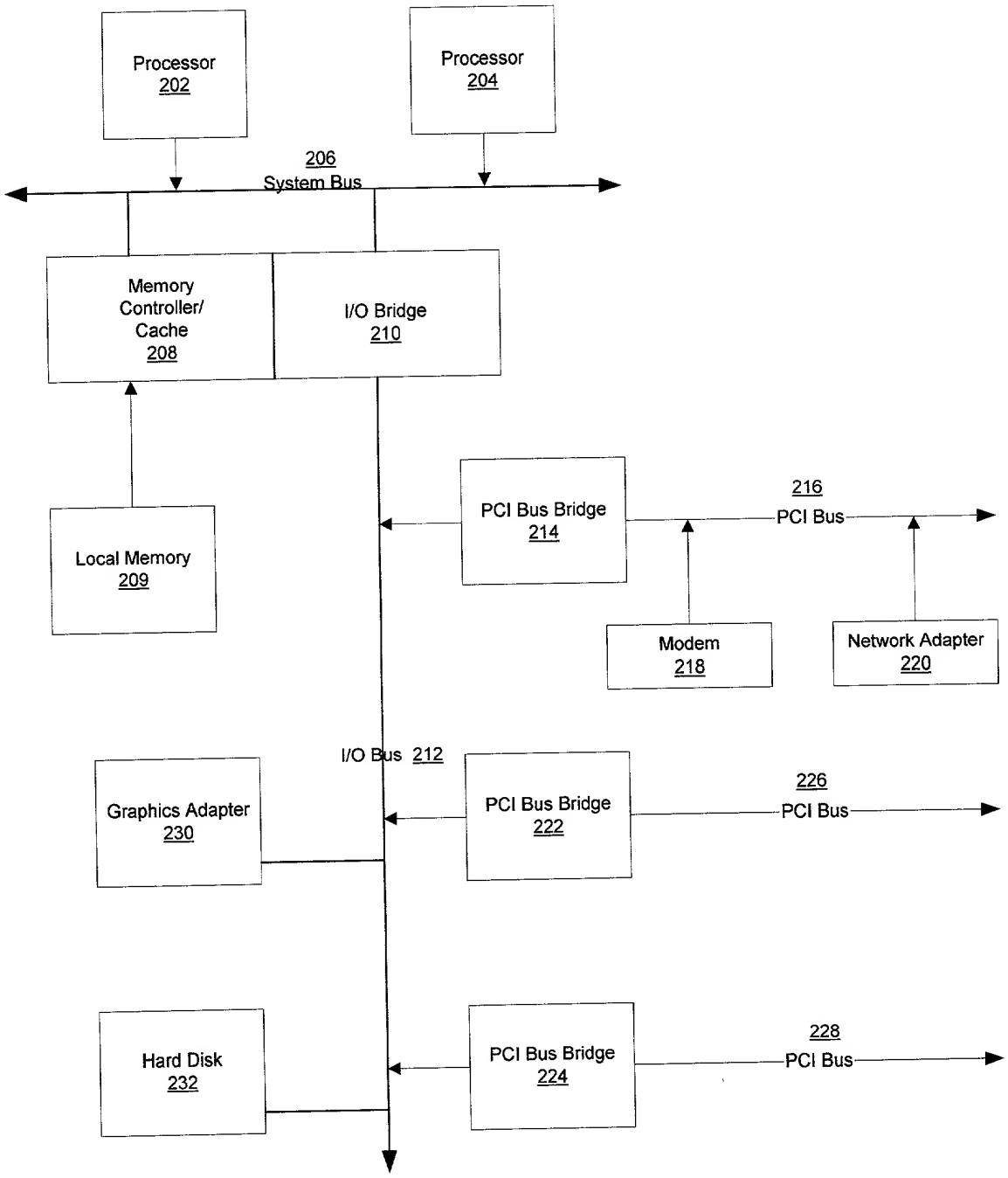


Figure 2

AT9-98-737

Server

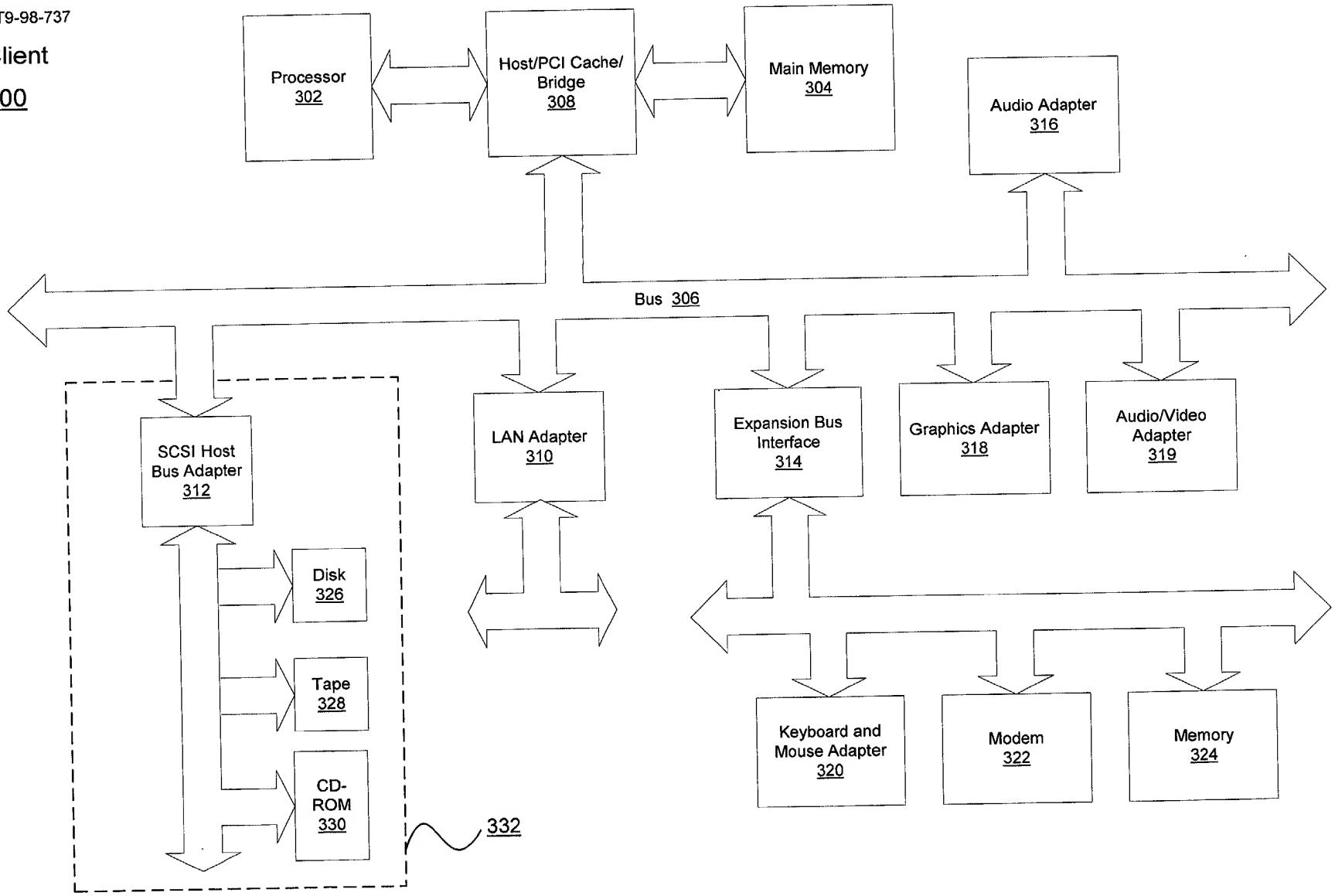
200

Figure 3

AT9-98-737

Client

300



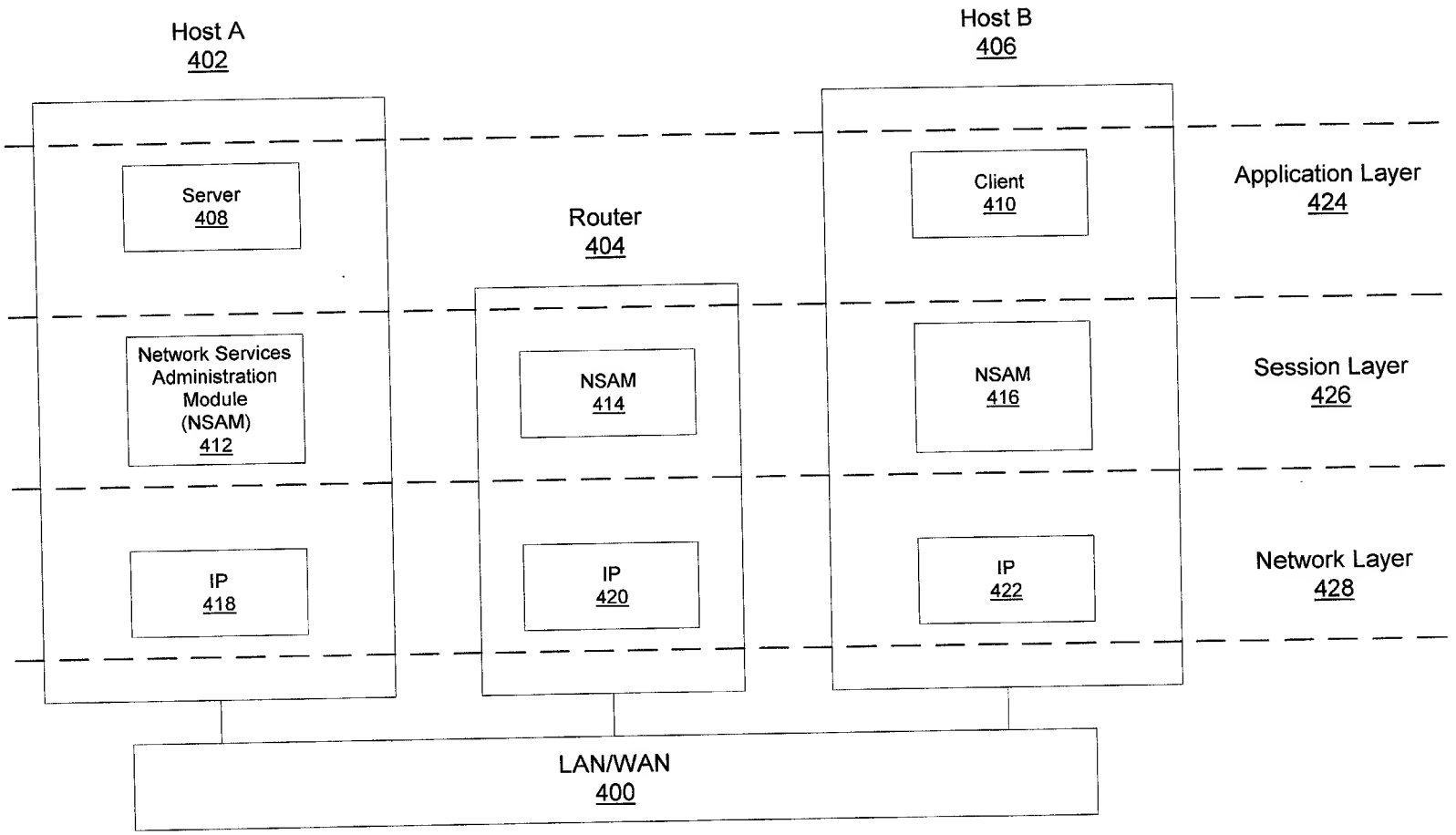


Figure 4

AT9-98-737

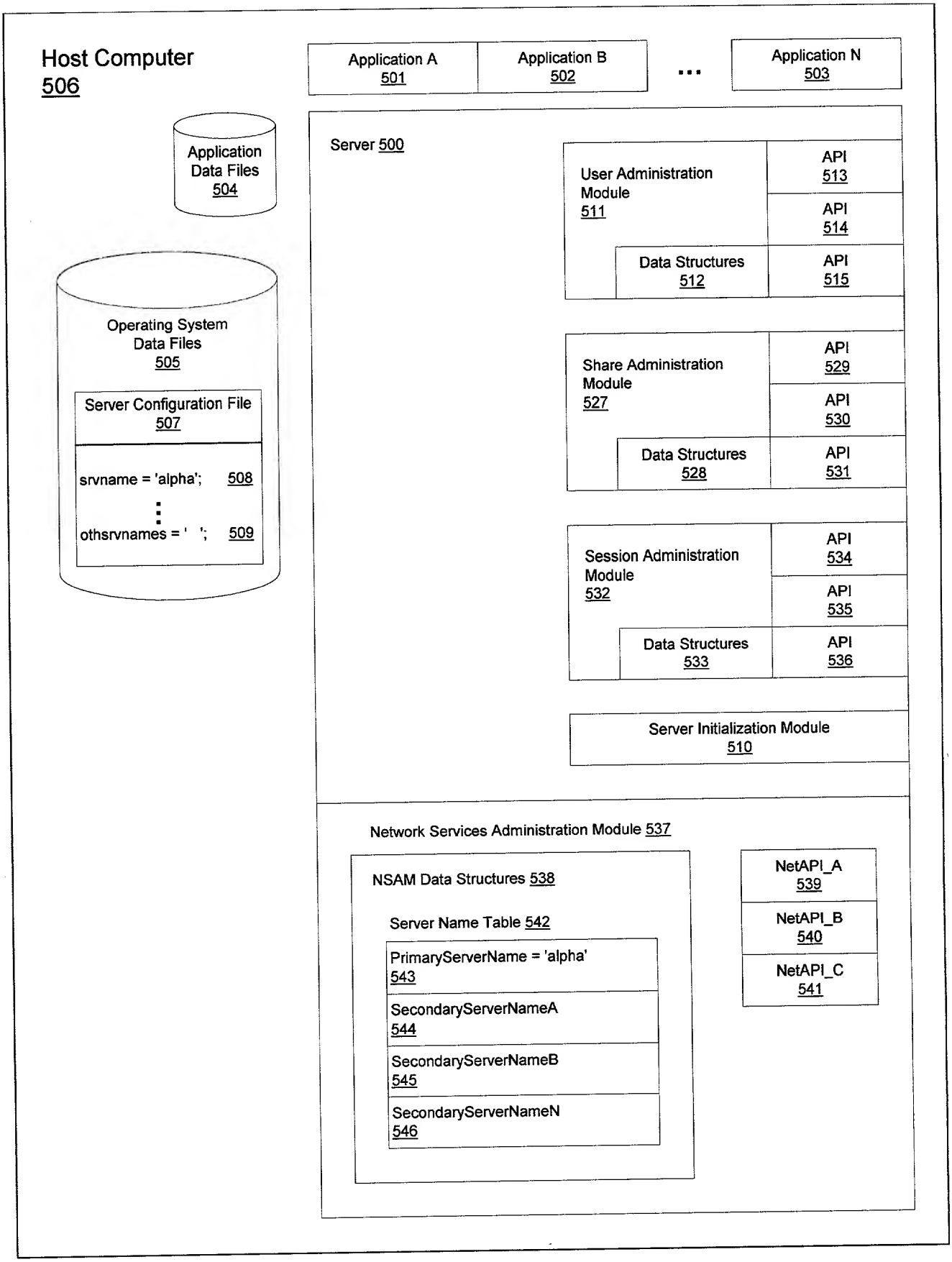


Figure 5

AT9-98-737

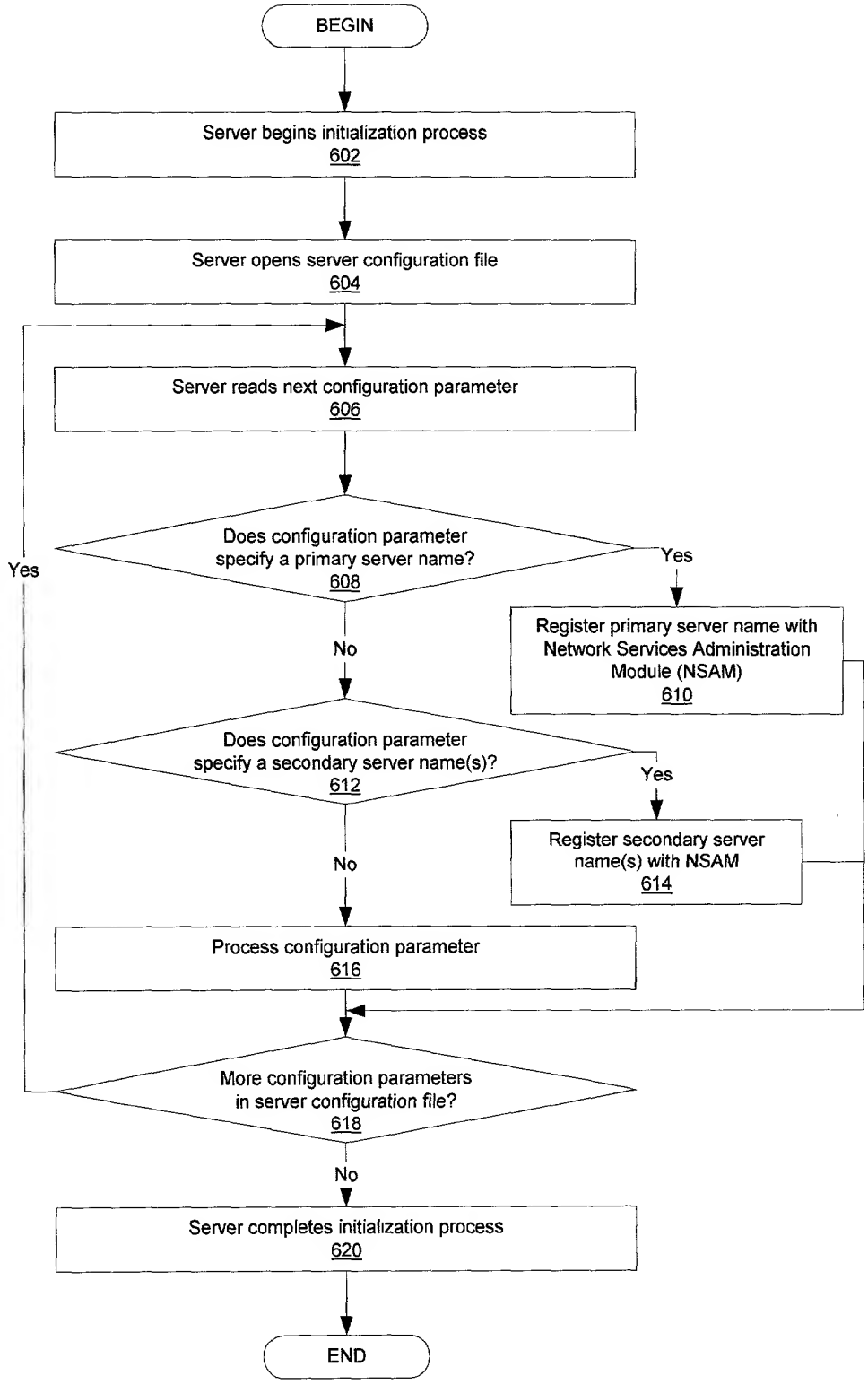


Figure 6

AT9-98-737

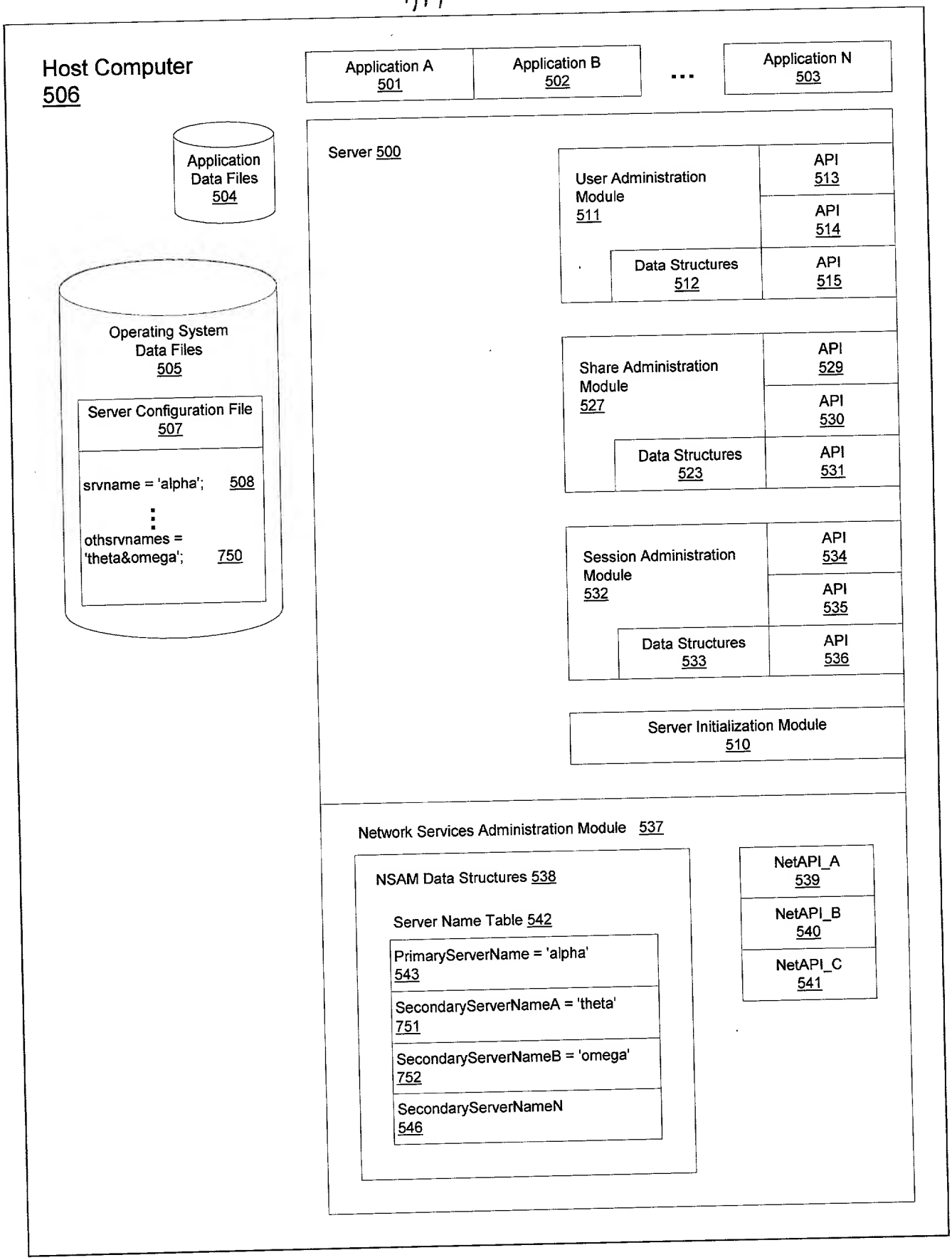


Figure 7

AT9-98-737

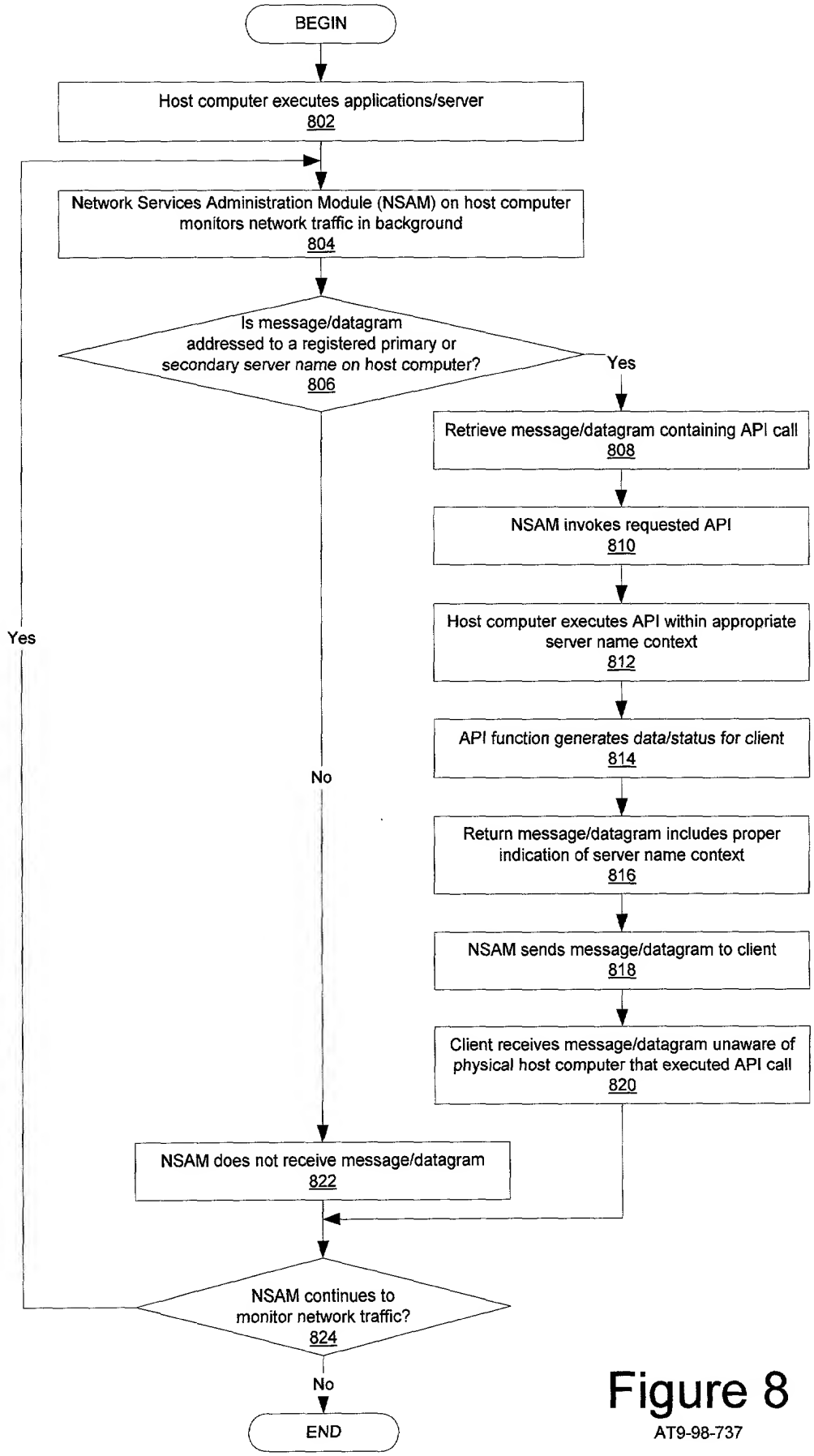


Figure 8

AT9-98-737

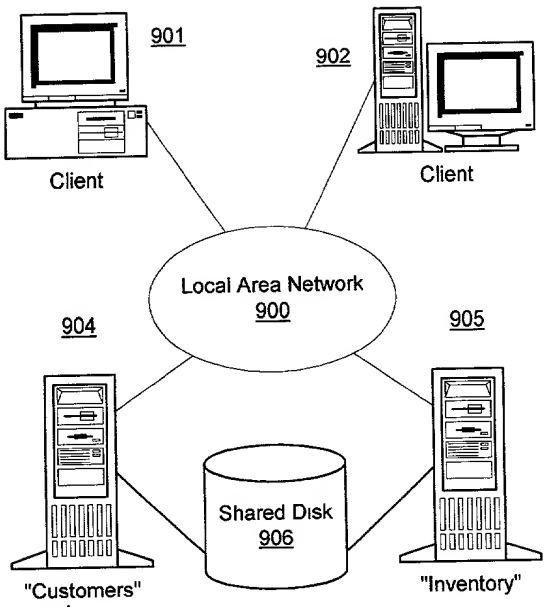


Figure 9A

AT9-98-737

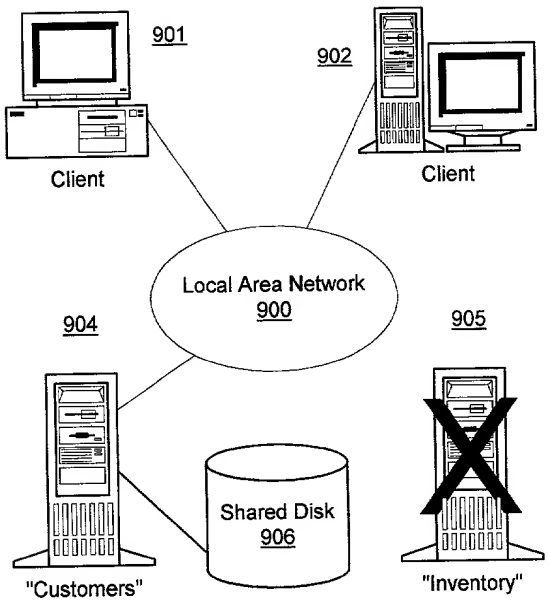


Figure 9B

AT9-98-737

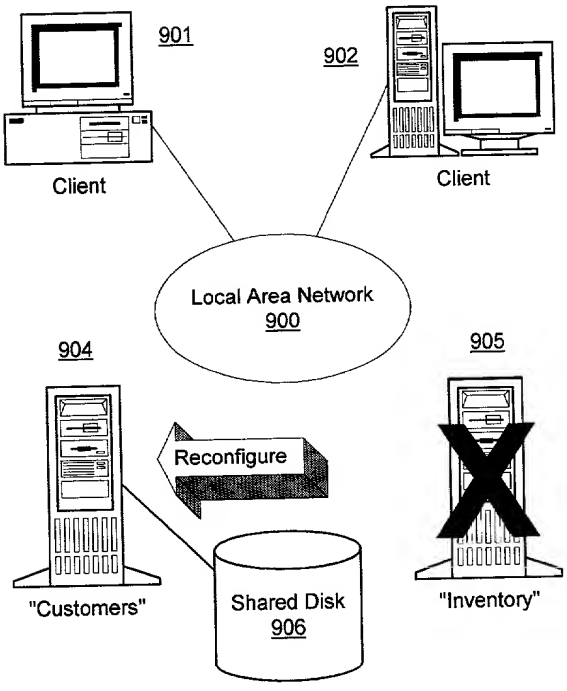


Figure 9C

AT9-98-737

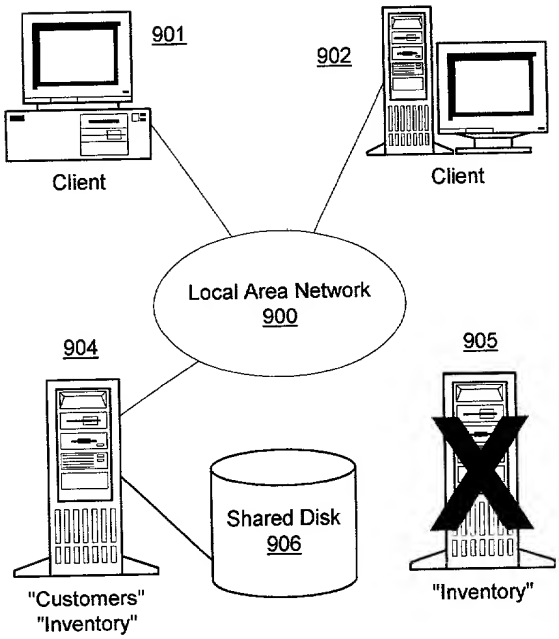


Figure 9D

AT9-98-737

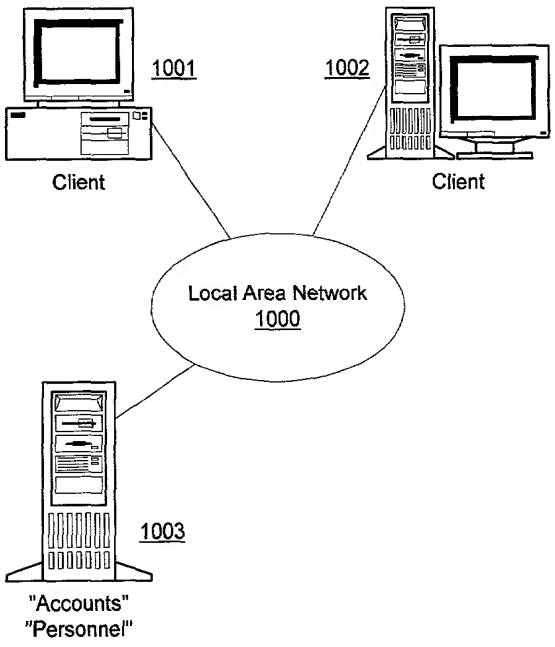


Figure 10A

AT9-98-737

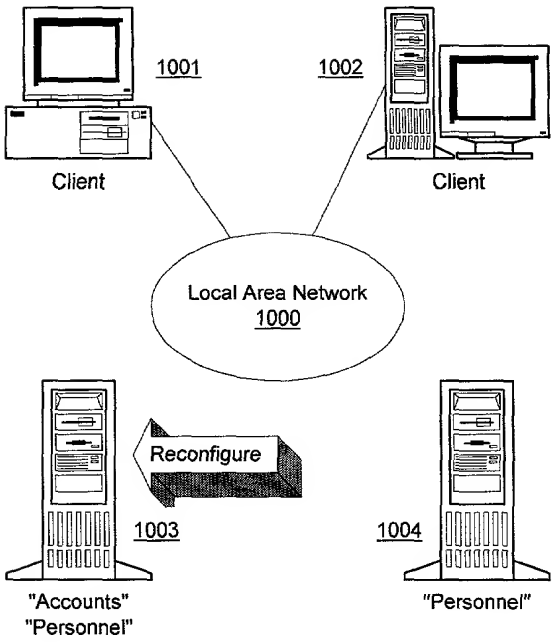


Figure 10B

AT9-98-737

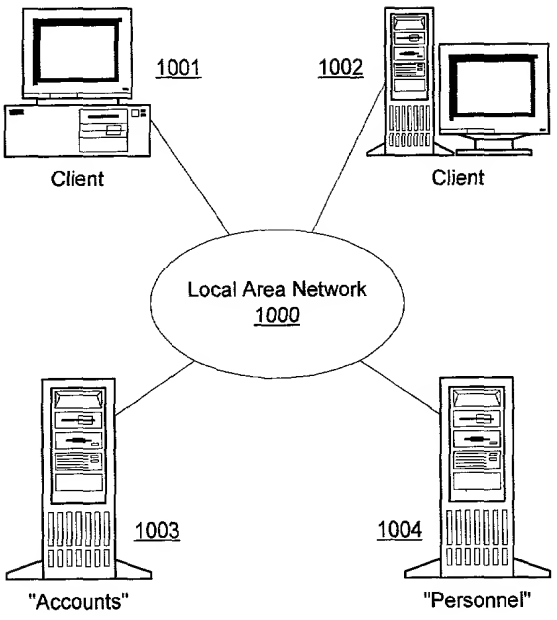


Figure 10C

AT9-98-737

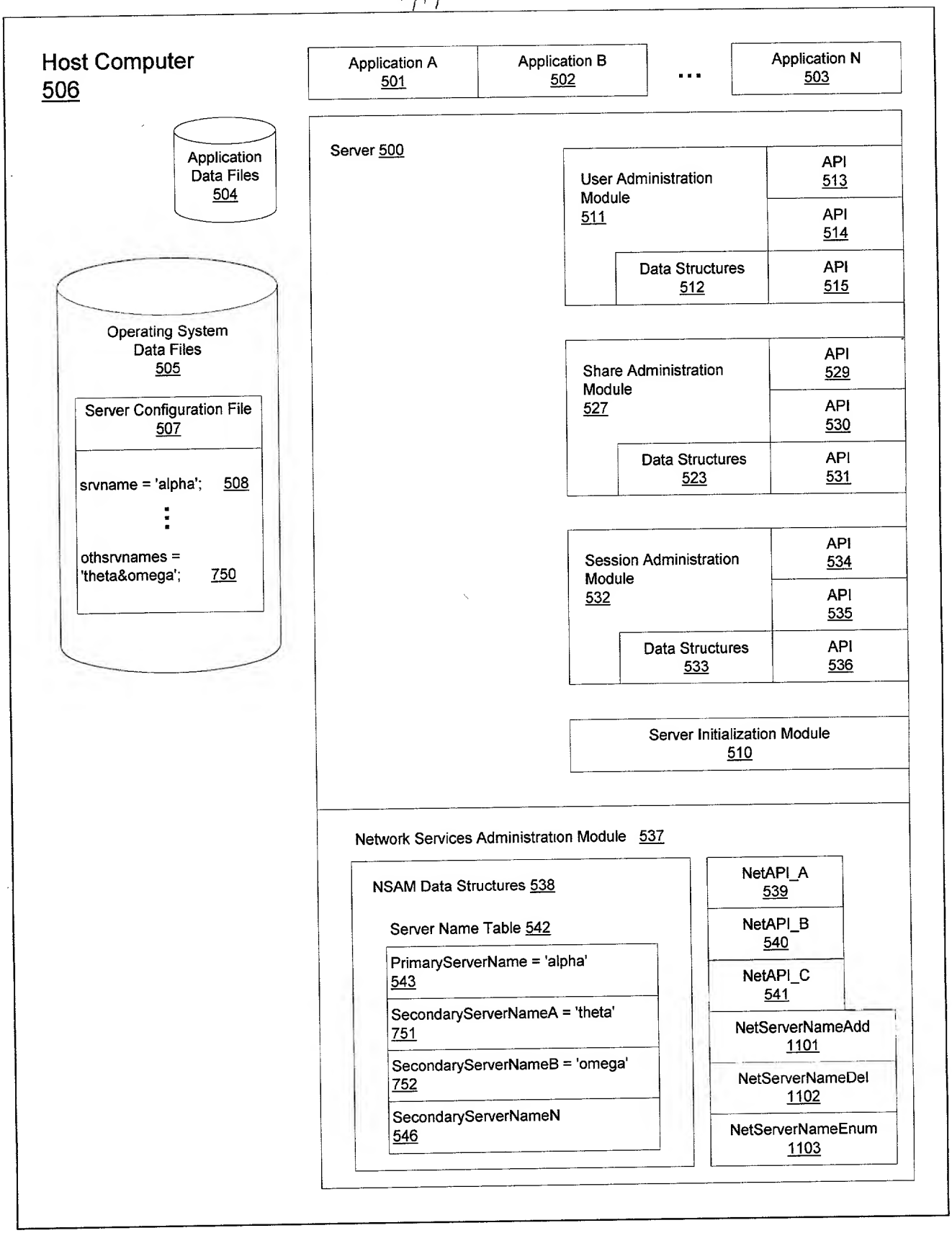


Figure 11

AT9-98-737

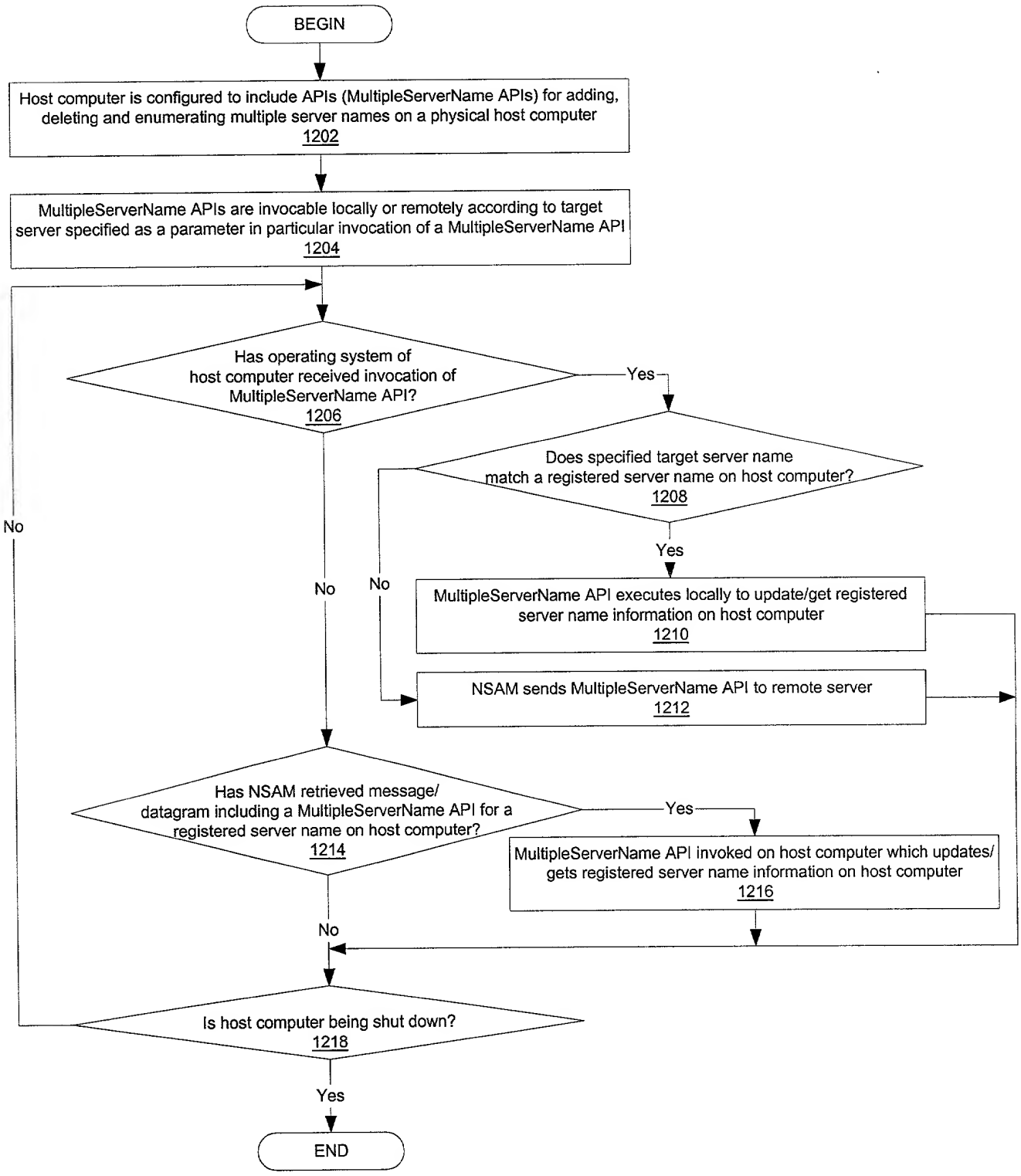


Figure 12

AT9-98-737

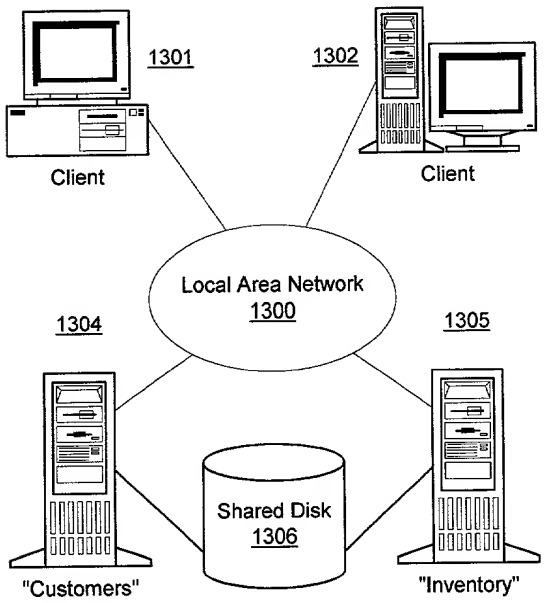


Figure 13A

AT9-98-737

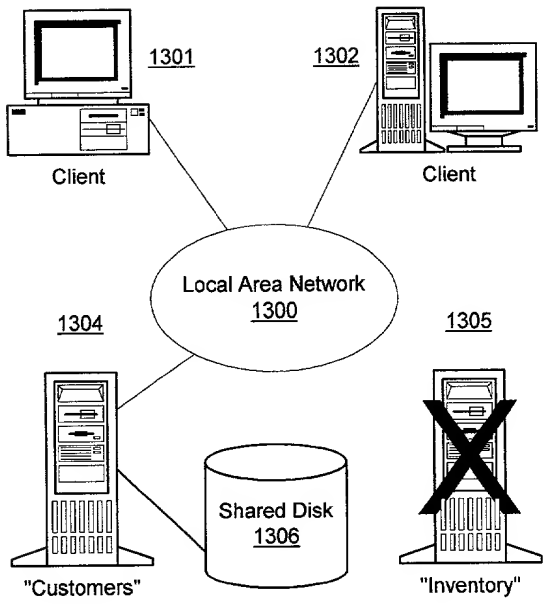


Figure 13B

AT9-98-737

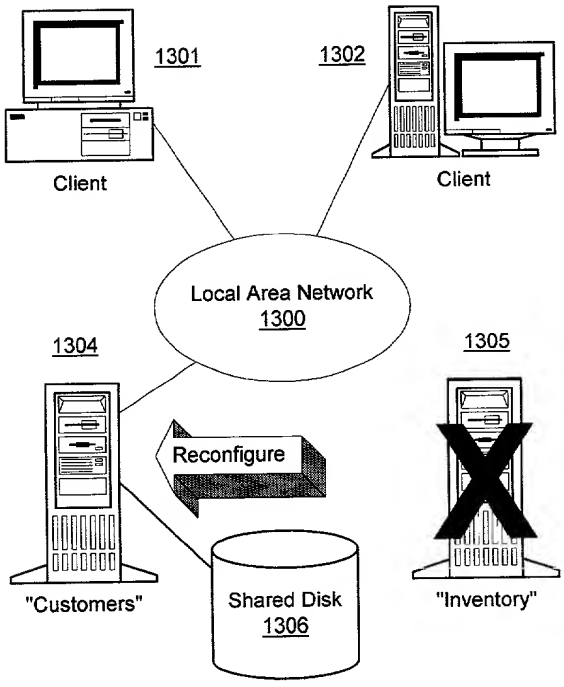


Figure 13C

AT9-98-737

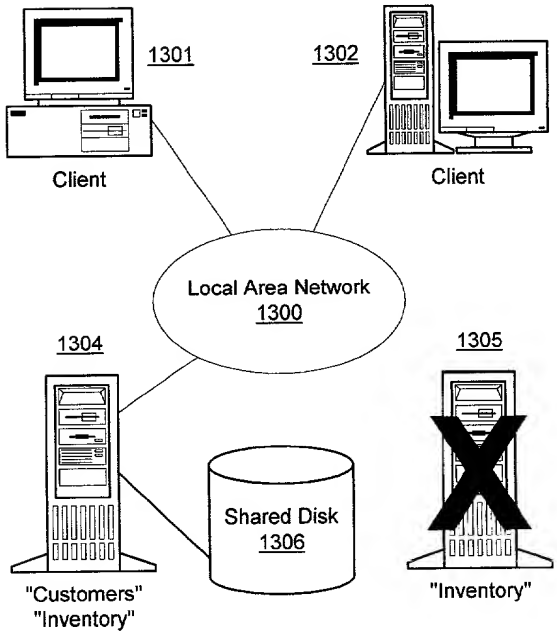


Figure 13D

AT9-98-737

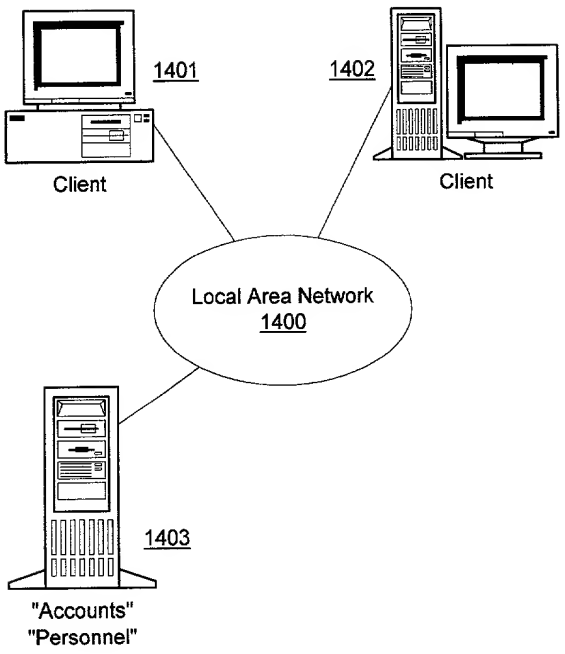


Figure 14A

AT9-98-737

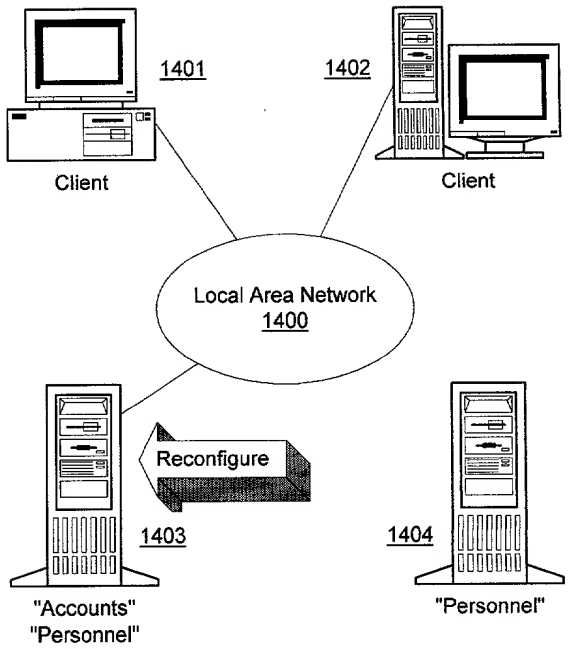


Figure 14B

AT9-98-737

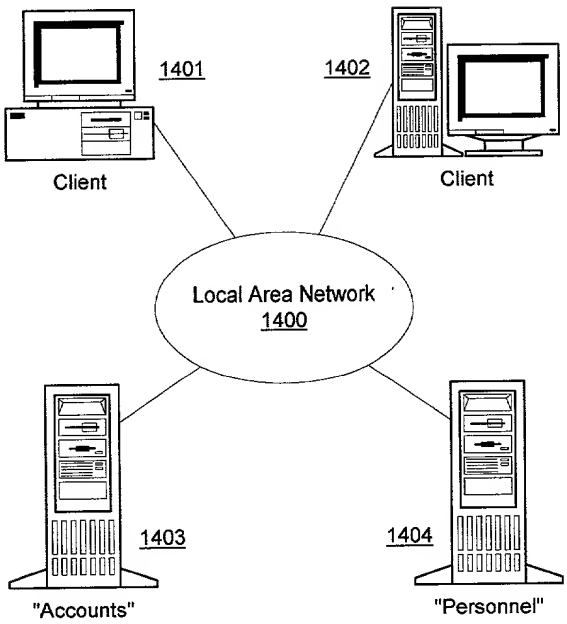


Figure 14C

AT9-98-737

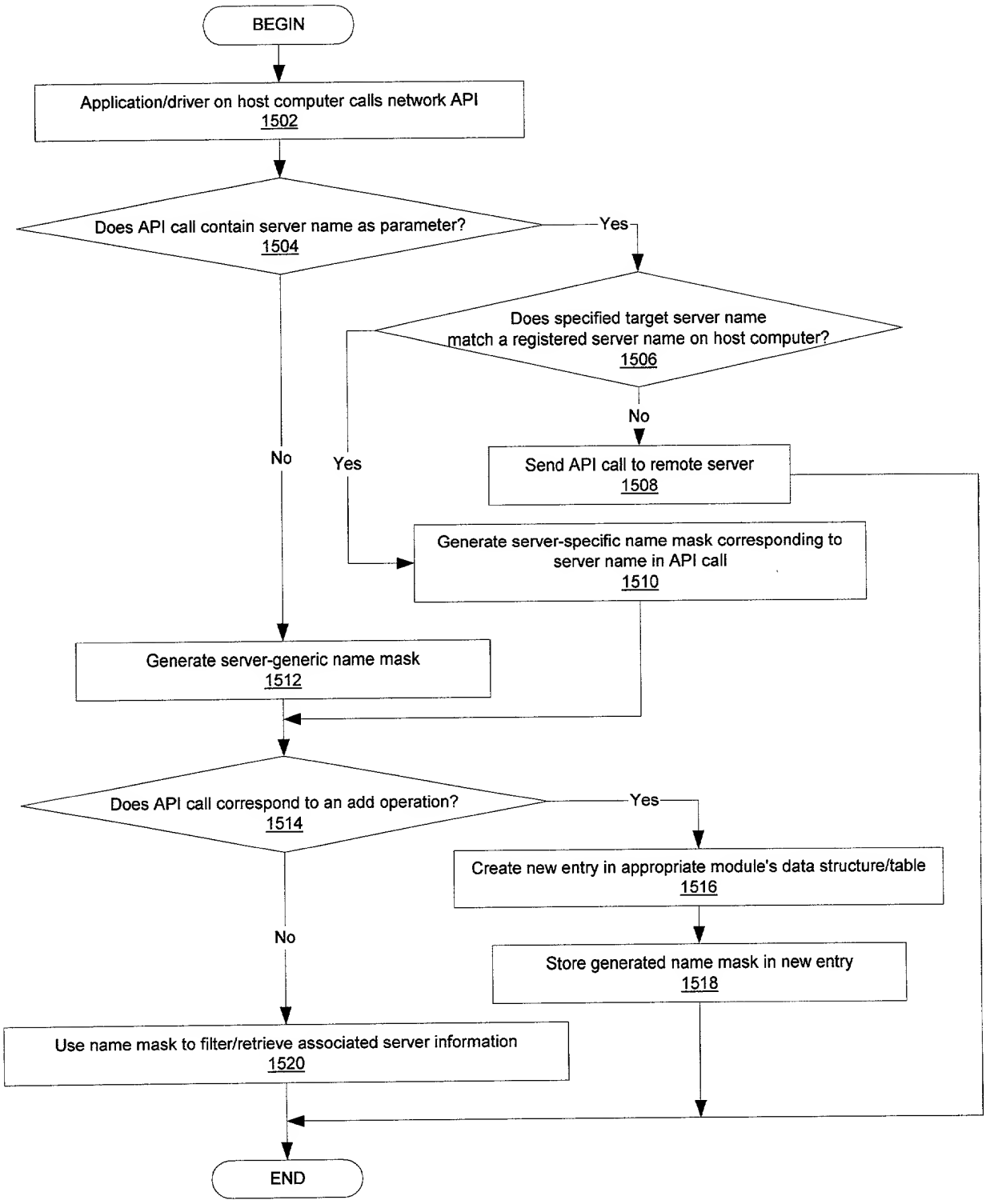


Figure 15

AT9-98-737

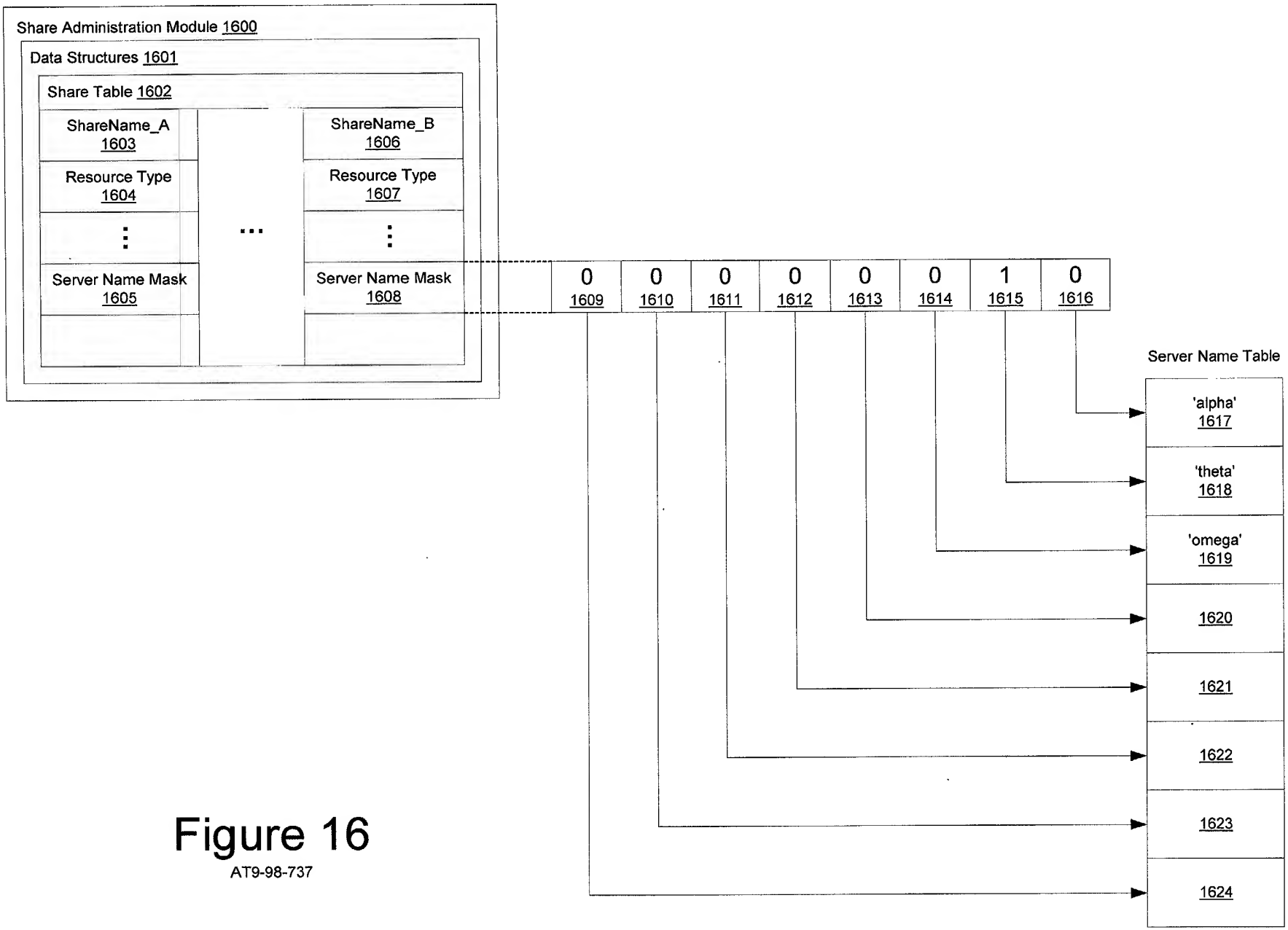


Figure 16

AT9-98-737

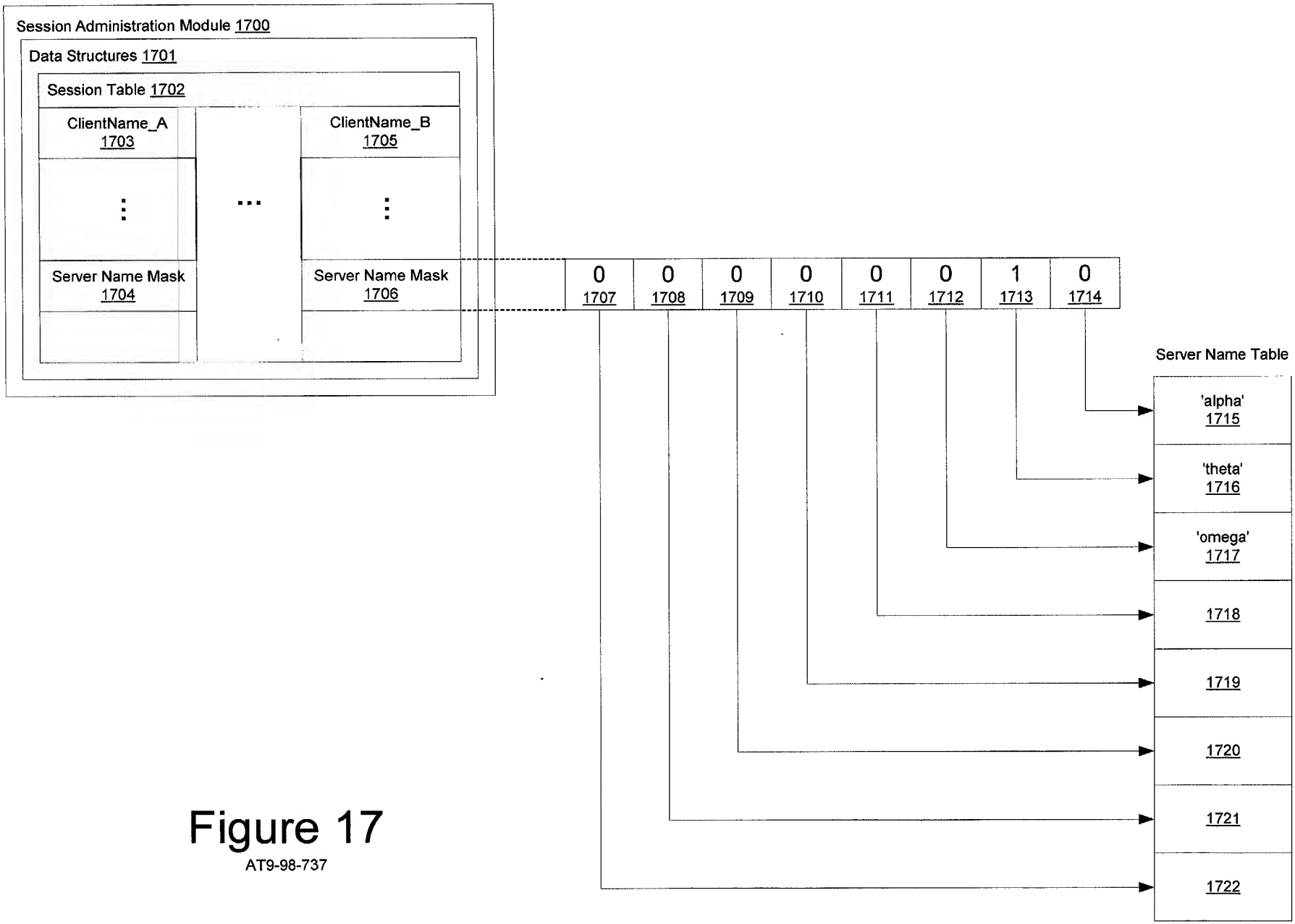


Figure 17

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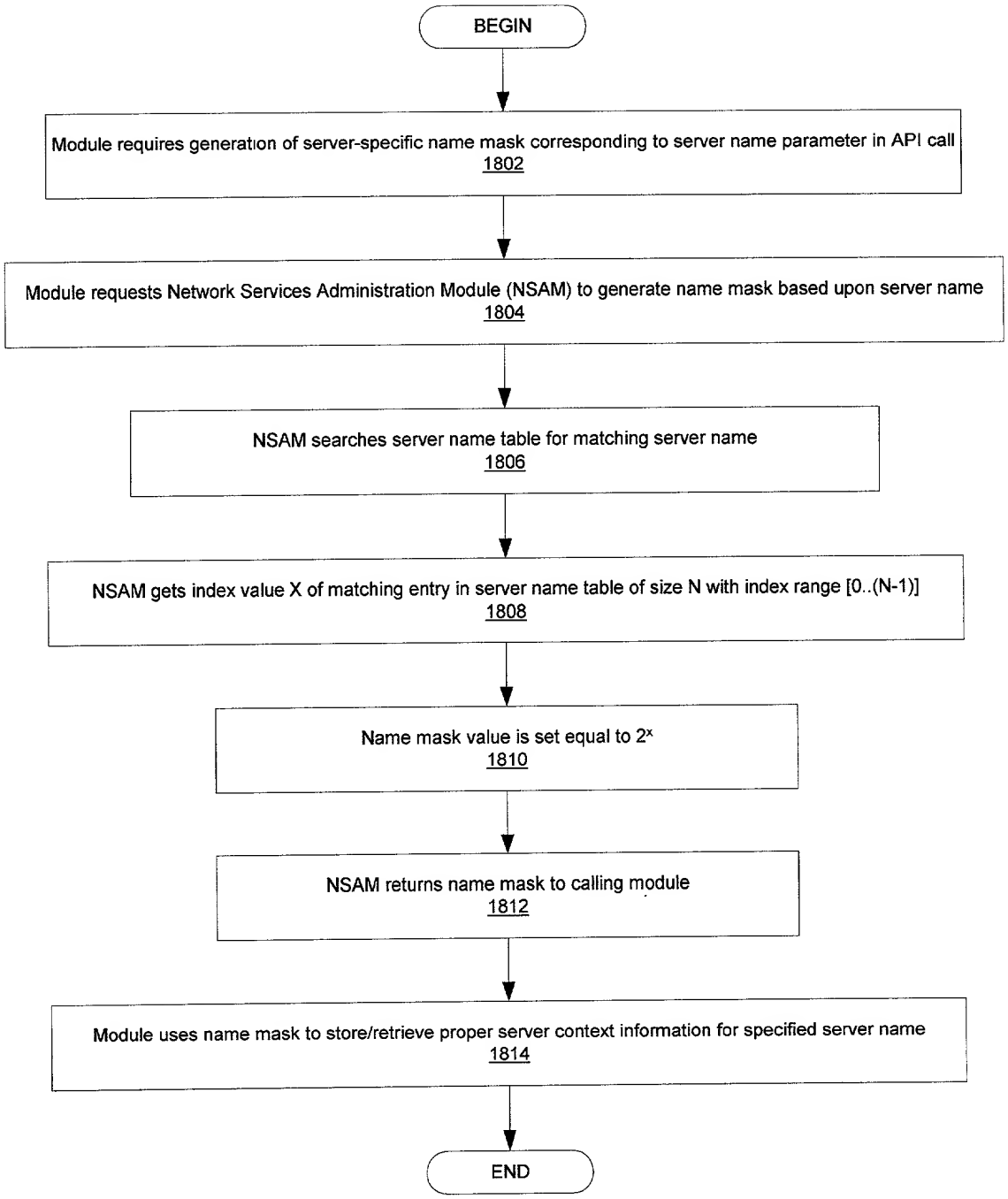

Figure 18

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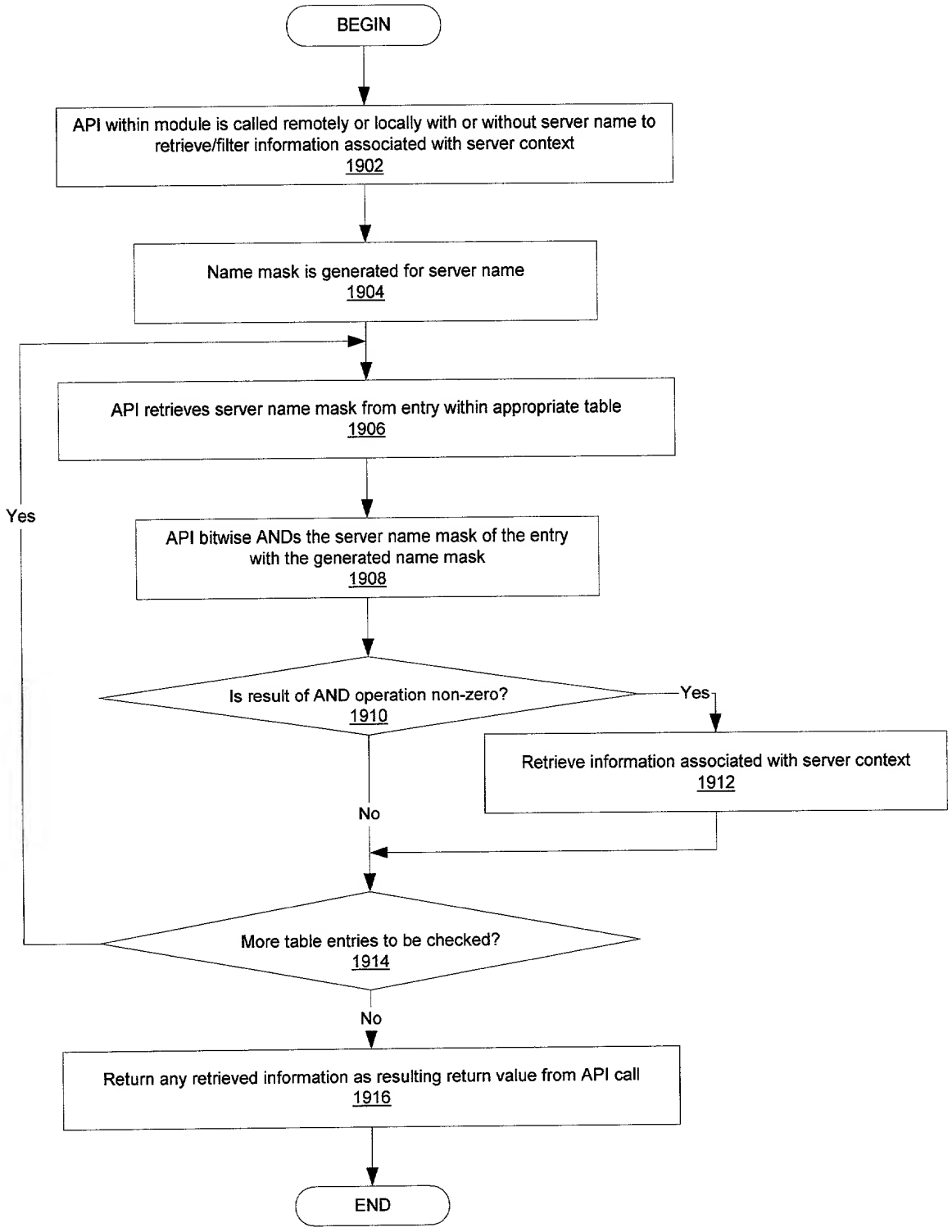

Figure 19

AT9-98-737

DOCKET NUMBER: AT9-98-737

DECLARATION AND POWER OF ATTORNEY FOR

PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND SYSTEM FOR ENABLING A NETWORK FUNCTION IN A CONTEXT OF ONE OR ALL SERVER NAMES IN A MULTIPLE SERVER NAME ENVIRONMENT

the specification of which (check one)

X is attached hereto.

__ was filed on _____
as Application Serial No._____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, '1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, '119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed
(Number)	(Country)	Day/Month/Year)	____Yes____ No

I hereby claim the benefit under Title 35, United States Code, '120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this applicaiton is not disclosed in the prior United States

application in the manner provided by the first paragraph of Title 35, United States Code, '112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, '1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial #)	(Filing Date)	(Status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

John W. Henderson, Jr., Reg. No. 26,907; Thomas E. Tyson, Reg. No. 28,543; James H. Barksdale, Jr., Reg. No. 24,091; Casimer K. Salys, Reg. No. 28,900; Robert M. Carwell, Reg. No. 28,499; Douglas H. Lefeve, Reg. No. 26,193; Jeffrey S. LaBaw, Reg. No. 31,633; David A. Mims, Jr., Reg. 32,708; Volel Emile, Reg. No. 39,969; Richard A. Henkler, Reg. No. 39,220; and Anthony V. England, Reg. No. 35,129; Leslie A. Van Leeuwen, Reg. No. 42,196; Christopher A. Hughes, Reg. No. 26,914; Edward A. Pennington, Reg. No. 32,588; John E. Hoel, Reg. No. 26,279; Joseph C. Redmond, Jr., Reg. No. 18,753; Marilyn S. Dawkins, Reg. No. 31,140; Duke W. Yee, Reg. No. 34,285; David W. Carstens, Reg. No. 34, 134; and Colin P. Cahoon, Reg. No. 38,836; Joseph R. Burwell, Reg. No. P-43,866; Rudolph J. Buchel, Reg. No. P-43,448.

Send correspondence to: Duke W. Yee, Carstens, Yee & Cahoon, LLP, P.O. Box 802334, Dallas, Texas 75380 and direct all telephone calls to Duke W. Yee, (972) 362-2001

FULL NAME OF SOLE OR FIRST INVENTOR: LUCIANO CHAVEZ, JR.

INVENTORS SIGNATURE: _____ DATE: 4-14-1999

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CEDAR PARK, TEXAS 78613

CITIZENSHIP: USA

POST OFFICE ADDRESS: SAME AS ABOVE